American Machinist

JUNE 3, 1936

FORD OPENS LABORATORY

New Rouge chemical and metallurgical research building, part of $37,000,000 expansion program, keys scientific work with production

A NEW chemical and metallurgical testing and control laboratory, one of the most modern industrial research departments in the United States, has been put into operation at the Ford Motor Company's Rouge plant. It is a unit of Ford's $37,000,000 expansion and modernization program. The laboratory is air-conditioned. It is furnished with new X-ray, physical testing and chemical analysis equipment which is used to analyze the molecular structure of steels, to determine the physical properties of metals and fabricated parts, and to analyze steels, iron, non-ferrous metals, textiles, paints, oils and rubber.

General functions of this department are to specify the quality of materials, to exert the necessary supervision over manufacturing operations to obtain quality, and to run tests on finished parts to maintain that quality, to uphold the 30-year tradition of the company in building vehicles for dependable and economical service at low cost.

The ordinary conception of industrial research and laboratory equipment doesn't fit the Ford picture. Instead of using a detached building for laboratory quarters, Ford experiments are conducted in or near the manufacturing departments where problems arise. Ford research workers do not live in an air of detached theory, but with production machinery at work around them.

Long ago Henry Ford refused to believe that the orthodox irons and steels contained the answer to every production requirement. So adjacent to the main foundry a metallurgical laboratory was established to develop new materials and new methods and to produce experimental castings. Here years of research have yielded new types of iron and steel usually fitted especially to accomplish some improvement in a given part.

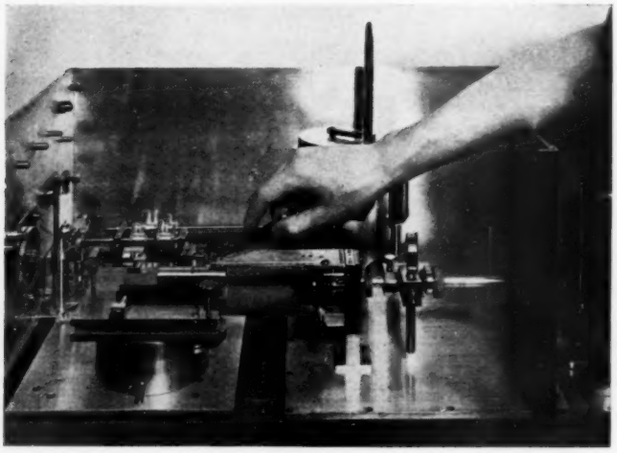
In this practical laboratory were developed the high strength malleable iron and numerous types of steel now used in producing Ford crankshafts, brake drums, pistons and many other parts. These new metals usually reduce production costs, but more important, they always improve quality.

In the X-ray department is a new machine with an oil-cooled fine focus radiographic tube of 230,000-volt capacity. It is sufficiently intense to penetrate four inches of steel. It can detect flaws less than two per cent of the total thickness of the specimen under examination. A crankshaft can be photographed with this camera in about three min-

Oil-cooled, fine focus radiographic tube of 230,000-volt capacity in the X-ray department of the Ford laboratory. It penetrates four inches of steel, and will photograph a crankshaft in about three minutes

Left—*Salt spray corrosion tests are made of plated parts in this special room lined with glass block and fitted with a rustless steel inner door.* Below —*Test panels are spray painted in this rustless steel booth, with hood to carry off vapors*

Profilograph, designed at the University of Michigan, for examining steel finishes. Imperfections, detected by a diamond point, are magnified 2,000 times vertically and 64 times horizontally



utes. The machine, of course, is housed in a lead-walled room. The operator watches the machine operate through a safety lead glass.

Equipment includes an X-ray diffraction machine with a new tube which secures in 20 minutes pictures which formerly took from 24 to 70 hours of exposure. This machine is used largely in research to improve the technique of casting and of steel treating through study of the atomic structure of finished steels and alloys.

To examine steel finishes the laboratory has installed a profilograph. Designed at the University of Michigan, the instrument is only the third one of its kind constructed. Through an optical magnifying system, any imperfections in steel finish which are detected by a diamond point are magnified 2,000 times vertically and 64 times horizontally. Thus the graph of a surface of a one-eighth inch specimen of steel becomes a readable chart eight inches long.

In the chemical laboratory all work tables are of "18-8" rustless steel.

Some Recent Developments of the Ford Laboratories

V-eight cylinder block cast in one piece.
New high-carbon cast steel crankshaft.
Glyptol enamel body and fender finish.
Cast alloy camshaft.
Cast alloy steel pistons for Lincoln-Zephyr cars.
Connecting rod bearings—cadmium alloy die cast on both sides of steel reinforcements.

Right—*One of two batteries of carbon combustion electric test furnaces. Eight of these furnaces are cooled by water piped through chrome-plated copper coils.* Below—*100,000 lb. tensile and compression machine for general material testing*

Each table has an electric hot plate on a level with it. Around the edge of the hot plate is a gutter, into which any chemical which might be spilled would flow. Hot plates are controlled from switches built into the tables. Each table has a tap for water, air, vacuum and gas and has plug outlets for electric appliances.

Four electric furnaces have been installed, with rustless steel hoods, for burning off precipitates and two others for experimental heat-treating work. Test panels are spray painted in a special booth which has a rustless steel hood and a special blower to remove the fumes. Two benches at one end of the chemical laboratory have been specially made to hold eight carbon combustion electric test furnaces, four on each bench. The combustion tubes of these furnaces are cooled by water piped up through chrome-plated copper coils. Distilled water is piped from a steam heated still to all the benches along both sides of the laboratory.

At one end of the chemical laboratory is a salt spray test room lined with glass block, which is non-corrosive and does not affect the accurate testing of plated materials. There are two doors into the room, the inner one being of rustless steel.

Metal samples are polished prior to being examined microscopically on a polishing table with three direct motor-driven polishing wheels available. Water is piped to each wheel to wash off the abrasive and to keep the wheel wet and cool. Specimens are mounted in bakelite in a miniature hydraulic molding press, which is hand operated, making them easy to handle.

Various parts of the Ford car are subjected to heavy blows, twisting tests and compression tests in the physical testing section of the laboratory. There has been added to the equipment a 100,000-lb. hydraulic general purpose tensile and compression testing machine with three scales to facilitate reading. A new light-weight hydraulic machine has been installed to test light parts, such as fabricated gears, spring wires, etc.

The laboratory is lighted throughout by an improved daylight system with batteries of five special bulbs providing a light as nearly equivalent to daylight as illumination engineers have been able to devise, using high-pressure mercury tubes and incandescent lamps.

The new laboratory is manned by a staff of 65 technicians working in shifts. Since an analysis is made of every cast of metal from the blast furnaces, some part of the staff is on duty 24 hours a day keeping an accurate check on materials used in the plant.

In addition to this new laboratory, Ford maintains much technical equipment and many small laboratories throughout the Rouge factory to check raw materials, control production processes and test finished parts. Every kind of raw material coming into the plant is tested to make sure it complies with Ford specifications.

ACCURACY—Yesterday and Today

IV—Expert chippers and filers of 50 years ago have yielded to the machine with its greater precision at less cost as interchangeable manufacture has changed from a dream to reality

FRED H. COLVIN
Editor

PRACTICE and theory battled each other 50 years ago in much the same way they do today, though neither of them was as good as at present. The old-timers of those days were just as sure that the boys coming along then could never hope to equal them, as any old-timer today is of the coming generation. And yet every generation has produced men who could do more accurate work than those gone before. Not that many of the old mechanics were not marvels, considering the tools they had. Few today could chip or file to compare with the old-timers of 50 years ago. But there is no need for it now, so why perpetuate an art that is no longer necessary?

Many old toolmakers did remarkably accurate work without the fine instruments that are necessary today. The caliper touch was cultivated to a remarkable degree. Some old railroad machinists could caliper the bore of a wheel, turn an axle to fit it, and give a close estimate of the pressure necessary to force it on.

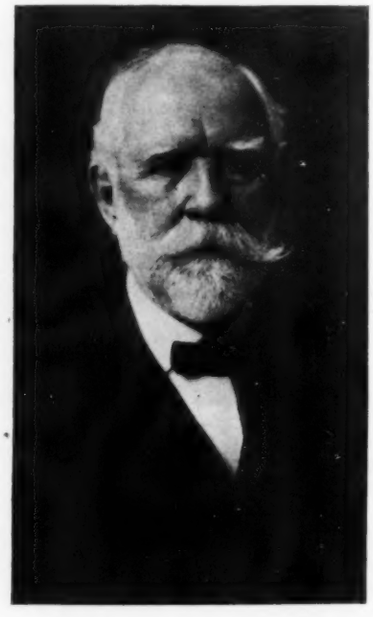
Accuracy has long been a bone of contention and failure to appreciate what it means has cost more dollars than we can even estimate. It is a subject that works both ways, and misunderstandings regarding it crop up with amazing frequency, in spite of all that has been written about it. One of the many interesting points brought out by Chordal, whose letters of 40 years ago were filled with good ideas for us all, was the necessity for designating just what grade of accuracy we really wanted. He told of a job shop customer who insisted that he wanted a dimension exactly the size named and then objected to the bill on account of its high cost. It turned out that the dimension was not particularly important but the customer had no idea of what "exact" meant.

Within the year I have seen a drawing by a splendid toolmaker that called for a fractional dimension, *with zero plus and minus tolerances to three decimal places.* Which shows that we learn slowly and that even some of the most practical of men do not fully realize that absolute perfection does not exist, except in imagination. That we come very near it is shown by the results of the work of Johansson and others. Most of us agree, however, that much money has been wasted by demanding greater accuracy than was at all necessary. The sooner designers and others realize that extreme accuracy costs money and make their tolerances as reasonable as possible, the better for us all.

As a side light on the subject of accuracy I recall the experience of a friend who sold Jo blocks in the early days, before their value or accuracy was appreciated as it is now. He visited a little old shop and interested the proprietor enough to have him send for his toolmaker, a grizzled veteran of the old school.

"Some of those new measuring blocks, eh?" said he. "Lemme see a half inch block. I've always wondered just how accurate they were." And he proceeded to check the Jo block with an old micrometer that had seen service ever since he was a toolmaker. "Knew they wasn't as accurate as they advertised. This block is out over a thousandth"—and he went back to the shop satisfied that he'd caught the city slicker with his trusty mike.

Nor is this faith in one's own tools limited to the man in the shop. I was discussing accuracy with the head of a good sized shop a few years ago and asked about his gage equipment. It hadn't been checked for years. So we got a few plug and ring gages out of the toolroom and gathered up some micrometers. The results were startling and left him in doubt as to what sizes he was getting in the shop. Eternal vigilance is the price of accuracy as well as of liberty, and frequent checking by master gages is necessary to prevent fooling ourselves as to what we are really getting in our products.



William Sellers, inventor of the standard thread

Threads and thread measurements have undergone great changes since my early days in the shop. The battle of the flat top thread versus the sharp V, was still raging. William Sellers had advocated the flat top and bottom, which was then known as the Sellers, Frankin Institute and U. S. thread. But on brass work and in other places many still clung to the V, even though everyone knew that a really sharp V was not practical. One phase of the controversy was the changing of the old half-inch standard from 12 to 13 threads per inch. Now I presume it would be hard to find a half-inch 12-thread tap or screw, except as a special.

Nor were the shape and pitch the only points of difference from present practice. Every machinist's kit had at least one pair of broad nosed calipers for measuring threaded diameters, *on the outside.* Pitch diameter was a term that only applied to gears—not

to screw threads. Those of us who have been close to the development of screw thread tolerances can probably appreciate the difference even more keenly than those who have come into the field since the war. I well remember when I first broached the subject of thread tolerances to Frank O. Wells some years before the war. Together we were largely responsible for the first Screw Thread Standards Committee. And I also recall large numbers of fuses for shells made before we entered the war, being rejected because the outside diameter was a few thousands small. The fuse maker simply had the threads rolled until the O.D. was according to specification, and they were accepted. The threads were doubtless a much better fit before they were rolled.

Some mighty good toolmakers had peculiar notions as to tools. When Frank Wells was an apprentice under John Grant he became acquainted with Simeon Phillips, credited with being the most skilled mechanic in Greenfield. He was very glad to talk shop with an apprentice who was interested in his work. But he had no use for the new fangled taps and dies John Grant was making in the Wiley & Russell shop. He preferred a tap made from a piece of square steel with the teeth on the corners as this saved fluting and the shank was already squared.

His favorite die was made by annealing an old, worn out file, drilling and tapping it in the center, drilling four small holes outside the thread and filing them into the tapped hole. This gave the cutting edge and chip clearance. It also gave the die stock, in the same piece. I've seen these used many times, sometimes with three or four dies of different sizes tapped in the same file.

How this old mechanic would open his eyes to see 30 to 50 taps driven at drill speed, in automobile work. This part of the tool industry has made great strides in the past 50 years.

Since then we have learned much about thread measurement for general shop use. Makers of thread gages have used the two and three wire system of measuring for years. And the flat nose caliper has gone its way. The first insight into the fact that full threads were unnecessary in most metals came from some early tests by, or under the auspices of, the Franklin Institute. These tests were made to see what percentage of a full thread was necessary in a tapped nut. As I recall, these tests showed that a half thread would break the bolt, at least on the sizes in common use, under one inch. In few cases is it necessary to get more than a ¾ thread depth, this now being pretty general practice.

Courtesy U. S. Navy

Master and apprentice of the 80's in a Navy Yard shop

One of my jobs as toolmaker was to grind square taper reamers for injector tubes. To measure the taper we had a set of ring gages made, with diameters ranging from ⅛ in. to ¾ in. The outside diameter of all the gages was 1¼ in. and the thickness of the gage was the same as the hole. By slipping two gages over the reamer and measuring the distance between the surfaces that made contact, the taper was calculated. How accurate these gages were I have no means of knowing. But at least we tried to be accurate—and a Brown & Sharpe micrometer added prestige to the tool kit. The grinding was done with a tool post grinder I made for the job, driven from a long drum overhead by a ⅝-in. round belt.

Interchangeable manufacture has been credited to a number of the early mechanics, such as Eli Whitney and Samuel Colt. Without meaning to detract in the least from the accomplishments of these and other pioneers, I cannot help feeling that really interchangeable manufacturing is of a much later date. In fact we have comparatively little even now, in the stricter sense. True, the early makers of guns in quantities made a beginning, with gages and templets, even for filed work. But tolerances were almost unknown and much fitting was necessary.

The officers of the historic Springfield Armory believed they made rifles that were interchangeable, but up to 1916 at least the only dimension with a tolerance that I recall, was the thickness of the bayonet blade. This carried a tolerance of 0.002 in. when a sixteenth of an inch would have been equally satisfactory. This is no more a criticism of the officers than of the engineers and mechanics in charge. It was simply a misuse of the term, interchangeability. Selective assembly has advantages in some lines of work, and is used in some parts of large production automobile work.

During the past 40 years I have had the privilege of meeting many officers of both Army and Navy. While we have had many differences of opinion, some of them more or less strenuous, I have always found them straightforward and impersonal to such differences. Some of these officers have been friends for many years, among them being Gen. C. C. Williams, former Chief of Ordnance, one of the broadest minded men I've ever known. His successor, Gen. W. H. Tschappat, is of a similar type, just what is needed in this position. I first met him in Manila in the spring of 1930 where his quarters in the Spanish barracks were full of historic interest. There were also many others with whom I had close and pleasant contacts, among them Generals Charles Wheeler and John Thompson, the latter of submachine gun fame.

10 BUMPERS A MINUTE

at CHEVROLET

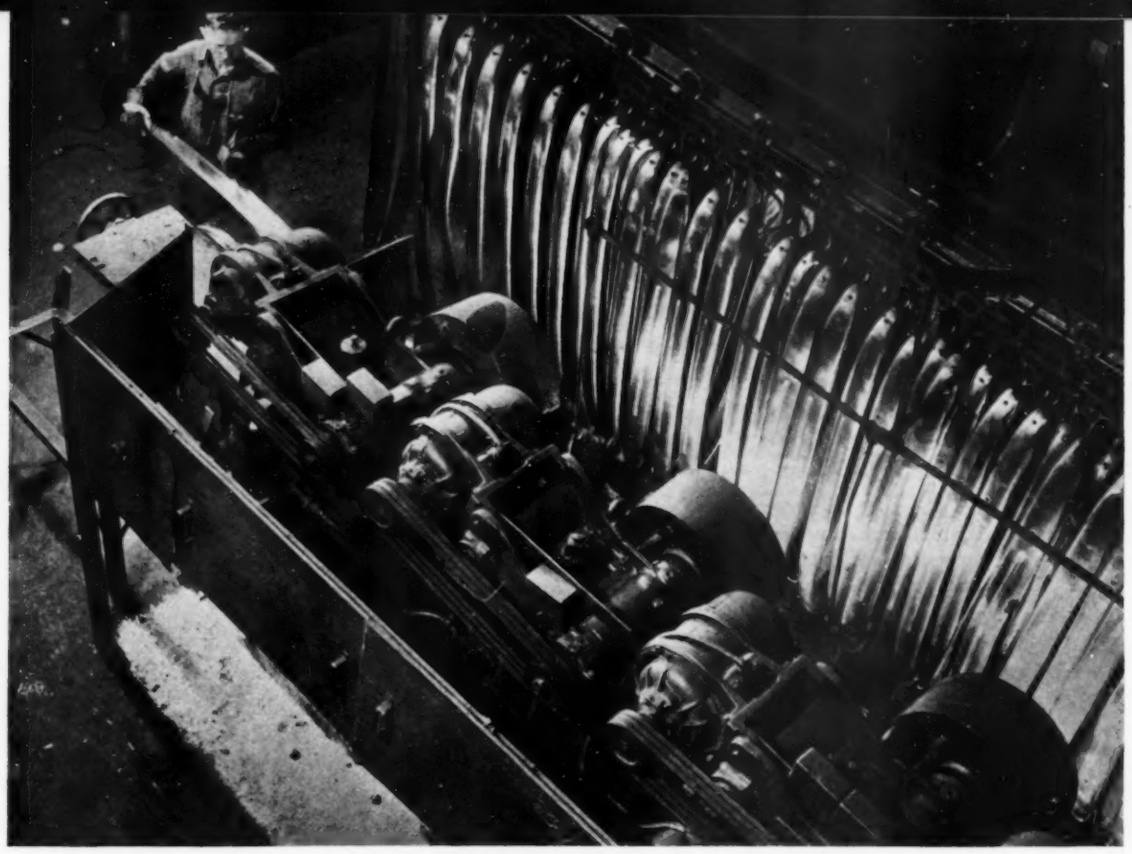
CHARACTERISTIC of Chevrolet's highly developed production methods is its output of bumpers at the Detroit and Saginaw, Michigan, plants. A pace of one unit every six seconds is maintained without sacrificing smooth work flow and a uniform product. Chevrolet is the only automobile company that carries through all the steps of converting spring steel into finished bumpers for its own use.

Trimmed to proper shape, formed in heavy presses, bumper bars are placed on carriers, eight to a load, for passage through five different tanks in which they are cleaned and washed. Preparatory to plating, bumpers are polished, traveling flat on a belt conveyor which carries them under polishing wheels arranged in three lines of fourteen wheels each. Wheels are 16 in. in diameter, run at 1750 r.p.m.

Inspectors, stationed at the end of the third line of polishers, check the finish, remove imperfect pieces. Operators at special machines correct defects when possible.

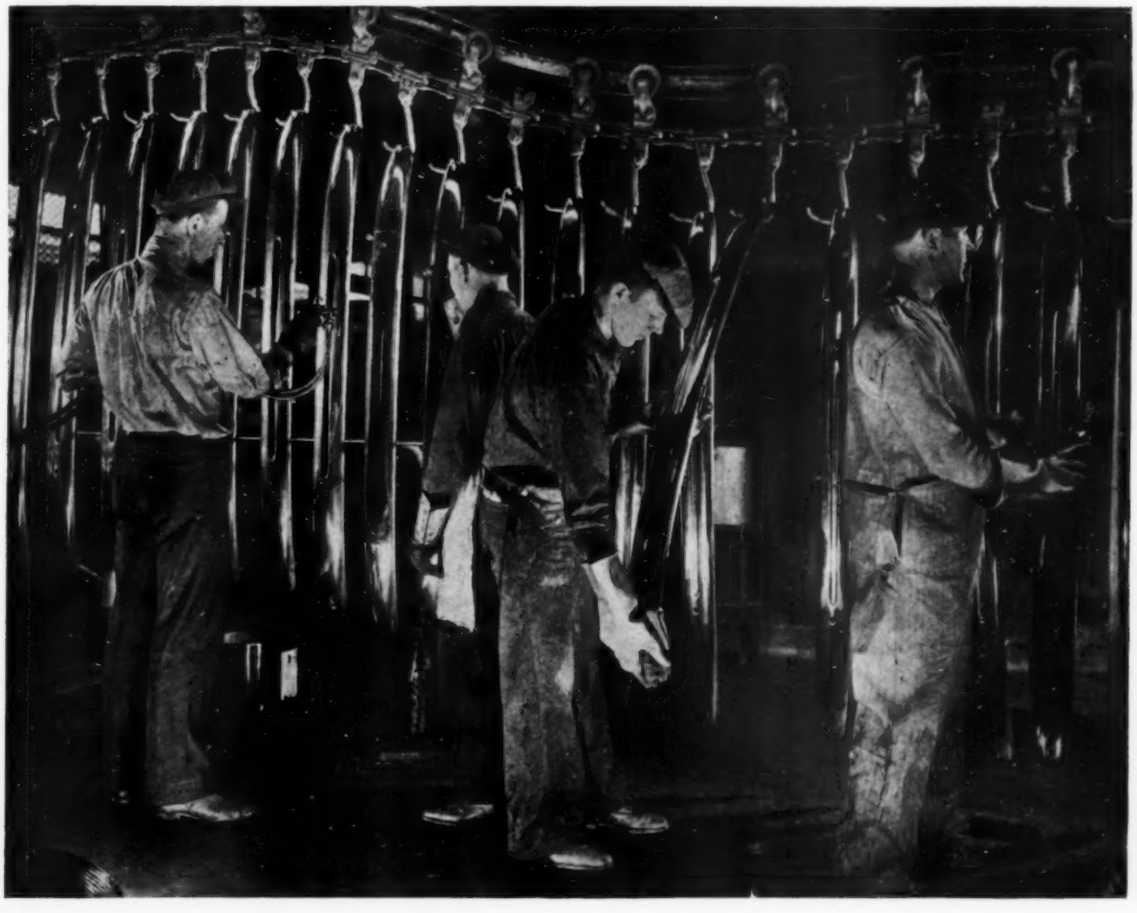
Past the inspectors, bumpers loaded on automatic carriers, go through nickel-plating tanks; then they are buffed on three lines of automatic machines. Next they are carried through the chromium-plating tanks. As they emerge bumper back surfaces are sprayed with aluminum paint making them ready for assembling and packing for shipment to Chevrolet's ten car assembly plants.

Hot shaped and perforated, a bumper bar is removed from the press while a second operator stands by to pass on an electrically heated blank for the next stroke



Bars are taken from the conveyor and placed on the belt which carries them under the high-speed automatic polishers; each piece goes through three lines, fourteen wheels to a line

Bumpers moving toward the left are wiped clean of the aluminum paint applied to the back before color is sprayed into the deep channel through a masking templet



Talking Shop

Patents and Spray Guns

Patents were originally granted to encourage invention and so secure the benefits of improvements to the citizens of the U.S.A. as well as to the inventor. But it doesn't always work

out that way. Metal spraying, for example, was patented in this country in 1915, but the use of the process was very limited during the life of the patent because it was felt that the licensing fees were much too high. Since the expiration of the basic patents about two years ago, ten times as many "guns" have been sold as in the previous twenty years.

Some rebuilt machine tools are doing a real job. One well known miller now has a 12-in. hollow cast iron spindle that is filled with oil which is fed out to the bearing surface by centrifugal force. And with a cutting speed of 198 ft. per min. there is some "centrif." The feed incidentally is 78 in. per min. with Stellite cutters.

Saving by Spending

Thrift is probably one of the most abused words in the language. It is usually taken to mean hoarding, or hanging on to money, when one is fortunate enough to have it. But one of the cases where you can save by spending is in the diamond tools used in dressing grinding wheels.

Those who know tell us that in most cases no diamond face should exceed $\frac{1}{8}$ in. for this work. When the point has worn so that it is $\frac{1}{8}$ in. wide it's time to reset the diamond. This not only does better wheel dressing, but the money it saves in hard dollars is astonishing. The value of the diamond worn away increases amazingly after you pass the $\frac{1}{8}$ in. mark. One dealer in diamonds for industrial use has made a gage that shows when the diamond should be reset. Most shops using diamonds could save money by paying attention to this point.

Floods are real calamities. They leave a plant in about as discouraging a mess as can be imagined. But aside from the cost and the delay they have their good points as well. As with other calamities they bring out the good qualities that exist, though often hidden, in nearly all human beings. They compel the reconditioning of machine equipment which frequently puts it in better shape than for many years. Shops that have had all their machinery completely overhauled should be able to reduce machining costs. Such cost reduction should encourage greater care in the maintenance of machine equipment in the future.

Mechanization's Magic

At one time there were 136 different makes of automobiles manufactured in the United States. That peak, according to *The Delco Remy Clan*, was in 1914 when the entire industry produced 543,679 cars, at a total wholesale value of $413,859,379. Each company averaged about 4,000 cars, valued at about $761 apiece, wholesale. During 1935, with only 27 makes, automobile plants produced 3,425,578 cars, valued at $1,811,300,000, wholesale. This was an average of about 130,500

cars per make, valued at $528 each, wholesale. The wholesale price not only dropped $233, or about 31 per cent, per car during the 21-year interval, but today's car owners are getting far more in dependability, transportation, comfort and style than anyone dreamed of 'way back then. The most ardent proponent of curbing mechanization and technological advance would hardly hesitate to exchange a 1914 jallopy for a 1935 model (and $233 to boot) even if he were not duly impressed by the fact that in 1935 about three-and-a-half times as many people were directly employed to produce automobiles as were employed by the 136 companies in 1914.

Diesels Again

Diesel engine advocates are finding new evidences of progress on both sides of the Atlantic. Abroad, as in the United States, they attract attention by building a few racing cars which attain high speeds on low fuel consumption. But the truck, or lorry, and the bus offer the best fields as yet. Figures as to performance, operating costs and other claimed advantages make interesting reading. Keep an eye on both England and Germany.

Welding generators are not designed for lighting, but one at least was pressed into service for this purpose during the recent floods in the Pittsburgh district. This enabled the Red Cross and other relief agencies to carry on their work.

British Shops Moved by Rail

Because of the increased mobility of industry, British railroads have in recent years taken up the function of moving factories both large and small from one part of the country to another. On one occasion, according to *Industrial Britain*, arrangements were made for the transfer of 950 wagon-

loads of machinery, 32 container-loads of office furniture and equipment, and 110 loads of household effects belonging to the firms' employees.

At times factories have been moved section by section, and at week-ends, so that there has been practically no interference with the normal practices of production. —*The Editors.*

SKILL—WHAT IS IT WORTH?

HOMER E. COY
Studebaker Corporation

Seasonal lay-offs and lower pay than his less skilled fellows drives many an ambitious apprentice into other occupations

OF 112 students, who were enrolled in my apprentice course, approximately half are not working at their trade. Some are employed in stores or filling stations; others are driving transport or beer trucks. One is selling insurance, several are working on production, and the remainder, if employed, are doing about everything.

These ex-graduates are working at various vocations because their yearly income is as much or more from such sources as from working at their trade. They also have steady work. These trained men are afraid to go back as they know it would be only temporary and that they would be laid off again soon. They know that the period of employment is now less per year for skilled labor than it was eight years ago.

Another strong reason keeping many graduates from their trade is that many were laid off immediately after finishing the apprentice course because of the depression. They consider themselves far too inexperienced and lacking in practical knowledge to hold a job. I know of two graduates who tried working in job shops, and were always laid off because they couldn't keep up the required speed. They did not grasp enough ideas nor obtain sufficient skill during their short apprentice course to qualify them after their long lay-off. It would require from six months to a year for these men to regain their speed and efficiency on jobbing work and to review the countless things that they have forgotten.

Season Too Short

Because automobile manufacturers change models simultaneously and because their engineering departments will not release drawings for the new models until a short time before the change, too much work is created for skilled labor to handle during a short period. This causes a shortage of skilled labor during model changes and shortens the period of employment of the average skilled worker to not much over five months per year. In other words, just long enough to get the new model out.

The period of employment is also shortened because of the advancement during the last five years in the use of welded jigs and fixtures, better equipment and simplified designs. Jigs and fixtures are being made in less time and with less work than they were five years ago, and automobile manufacturers are forcing changes through in less time than they did previously.

During the rest of the year, approximately seven to nine months, about half the skilled labor is laid off and must move from one job shop to another or be left to work at semi-skilled jobs. This condition is especially true of jobbing shops, because they depend on model changes for their work.

During the nine years of my employment I have seen a steady change in the amount of work per year for the skilled worker. It grows less each year.

Staggered Models Would Help

To distribute the work for skilled men, throughout the year, the automobile manufacturers must change their models at different times. This would give jobbing shops a chance to be busy the year round working on different car models. If it is essential that all car manufacturers change models at the same time, then their engineering departments should release drawings a long time before the new model is to be announced. This practice would give jobbing shops more time to produce jigs and fixtures, their men a longer working period and help reduce the shortage of skilled labor.

If the condition now existing in the automotive industry is not changed the shortage of skilled labor will probably lead to specialized training rather than to all-around training. Thus, with some additional training, a good crankshaft or camshaft grinder man would do toolroom grinding during a model change or a good production lathe hand would be put on toolroom lathe work. This practice would also help to lessen the shortage of skilled labor during the change.

Too Good to Advance

The skilled man who is exceptionally good at his work spoils his own chances for advancement. When one becomes so skillful that the company depends upon him, they will give the advancements to someone who is less skillful. In other words, a man can be held from advancing because he knows his job too well.

I have seen this take place time and time again. I know of one man who was transferred from one department to another because he could not handle the work and was finally given a foreman's job because he was the only man in the department that they didn't need. I have talked this over with several executives, and they are of the opinion that a good skilled worker will never make a foreman, but they do not give a good reason.

The real reason, as I see it, is that an exceptionally good skilled worker is harder to get than a foreman because the foreman's job does not re-

quire the knowledge and skill that the worker must have. Consequently, when the company gets a good skilled worker they keep him on one job, and regardless of ambition, education or skill, he is held down because he is considered hard to replace. If the skilled worker with ambition were allowed to advance as he deserves, the companies would have better executives. One cannot be an exceptional skilled man without qualifications for a better job.

My experience in watching men rise from the ranks has shown me that companies are careless in the selection of executives. If they looked among the good skilled men, especially the college graduates, they would find men who are better qualified to handle the higher paid and executive jobs.

Skill Vs. Production

I have checked the pay of piece-work production men and skilled workers and find that in our city the production men are making more per hour than the average skilled man. The difference is as much as 30 cents an hour; in some cases the rate for the skilled worker equals that of the production man, but in general it is much less.

In checking into the pay per year I find that the part-time skilled man is making from a third to half as much as the production man. The latter earns every cent, but I don't believe that the skilled man is being paid his share. It should be remembered that he has spent from three to four years in an apprentice course, working for about half the wages of the production man; he may have taken machinist correspondence courses or gone to night school and invested hundreds of dollars in toolmaking equipment.

The production men in our plant are fortunate in being paid the highest hourly rate in this vicinity. They are paid more than the skilled worker for two reasons: first, they have increased production by working faster; and, second, the company bought many new machines that increased production but did not cut the rates.

I know that the skilled men in our plant will continue to get a fair deal and that they have always been paid the highest possible rate. Outside of our plant I cannot say what change will take place with regard to pay. I do not believe that jobbing shops will pay the rate they should until they can work and make a profit the year around.

Apprentice Training

O. W. SCHRICKER

IF THE number of articles on apprentice training that have been published in the *American Machinist* and other trade journals from time to time can be taken as a criterion, the problem of replenishing the supply of highly skilled workmen is receiving the attention of many industrial executives.

It is my opinion that the present methods of apprentice training are far from efficient. Too much time is consumed in non-essentials and not enough is given to the problems at hand. My opinion is based on many years of experience in the metal-working industry; several years teaching shop subjects in the engineering department of a university; and a period with an apprentice training program in a public-school system.

Apprentice training in most plants is inclined to be a haphazard arrangement. If the person responsible for the training is a shop man, he usually has other duties to occupy his time. If he is from the office, he lacks the necessary appreciation of the problem fully to understand it.

Now how are we to increase the effectiveness of apprenticeship? To begin with, each employer, large or small, must realize his responsibility to himself and his industry and do his part in training boys for the future. The small shop owner is better able to speed up the process because of his personal contact with his apprentices. The management of a large plant must secure the services of a supervisor and make an investment in the training of boys.

Instead of the present methods of training, wherein a boy is assigned to a foreman or a department for a given period and is allowed to make his way as best he can, depending upon the time his foreman can devote to him, I suggest that methods similar to those in use by schools be introduced.

That is, regular periods be assigned to each boy for intensive instruction by a person competent to impart the necessary knowledge. For example, when the boy is assigned to a department, instead of placing the responsibility for his training upon the foreman, this task should be delegated to someone else. The person to whom the task is delegated can be one of the regular machine operators who leaves his own work for short periods to act as instructor, or better still, an instructor might be employed to go from one apprentice to another throughout the entire working period, helping here and there, instructing the boys in short cuts and pointing out interesting operations.

Class Room Work Helps

Instruction on the job can be supplemented by class periods where the boys can bring their problems for explanation and the related work to be taught. Another method of teaching related work is to delegate the responsibility to the local schools. Most schools will gladly cooperate if enough boys are enrolled.

In a toolroom or a machine shop doing general work another method is suggested. An apprentice is assigned as a helper to a group of six or eight men. He runs errands, helps in moving material from place to place and makes himself generally useful. In a very short time he learns to drill and tap holes and do simple machine work. In this way he learns, not from one man but from six or eight men. I know from personal experience that this method will produce results. It is surprising how soon a boy can learn to do much useful work if given a chance.

Under the present method the apprentice is not given a chance to progress as rapidly as his ability warrants. He is bound by ties of tradition to this or that operation for so many hours or weeks, when, as a matter of fact, he could and would progress much more rapidly if more attention were given him.

I have observed apprentices doing the same operation over and over again for many weeks. After a few years they are thrust upon the world only to find that they are half-baked mechanics, not intentionally, but through a lack of understanding of the problems of apprentice training.

VERSATILE METHODS MAKE A VARIABLE DRIVE

III — Because of a well-planned arrangement Link Belt is able to take full advantage of its new facilities for manufacturing the P. I. V. Gear

JOHN HAYDOCK
Managing Editor

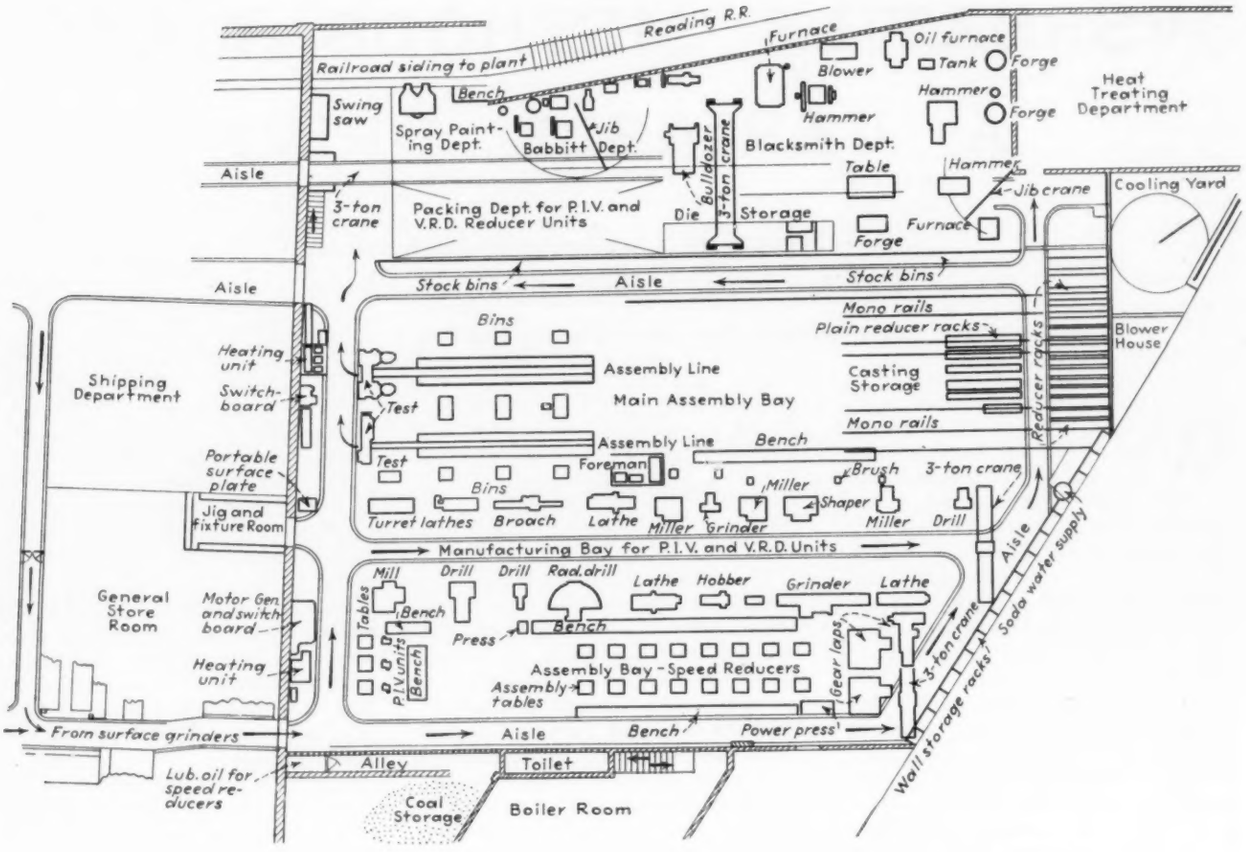
WHEN the Link Belt Company first decided to install a new and separate department for manufacturing its P.I.V. gear, the first step was to attack the problem of improving methods of machining and heat-treating. The way in which this was done and the results achieved, have been described in Article I and II of this series.

After this there remained another important step in planning—to lay out the new department so as to coordinate the advantages developed for individual operations and to obtain a work flow that would combine a minimum of material handling with efficient working conditions. The shop layout accompanying this article gives an excellent idea of how this was done. The layout of the heat-treating department is not shown in detail as this was done in the preceding article on this subject.

It will be noted that the castings come into a separate building, where a Gardner and a Diamond surface grinder are located. Flat surfaces suitable for operations on these two machines are ground here, and the castings are given the first paint coat before going into the P.I.V. department proper. This arrangement is laid out to keep all dust and grit from the castings from settling on the precision machinery used to finish the P.I.V. parts.

It will be noticed that the aisle which the castings take from the grinders to the P.I.V. department passes a general storeroom. Here supplies are kept, including an inventory of 600 electric motors. This stock permits quick shipment of a large variety of transmission units with electrical equipment. The jig and fixture room which is built into one corner of the storeroom is opposite the center aisle of the shop and is thus conveniently

Parts for the P. I. V. Gear pass progressively from one machine to the next in a layout that avoids backtracking



Machining, heat-treatment and assembly bays are arranged for straight-line work flow

Parts are stored in bins against the wall and brought to intermediate storage racks for assembly on roller benches

Good light, ample room and adequate crane facilities contribute to good housekeeping in the main assembly bay

reached from the machine positions. Inclosed wall storage racks at the opposite end of the shop are used to store a wide variety of cutters and other tools.

The general plan followed is to use the center aisle of the shop for machining the P.I.V. gear units which are then taken to the main assembly bay and stored. Castings are stored at one end of this bay on racks designed for the purpose. Against the far wall is a row of stock bins to carry the smaller parts.

The bay on the opposite side of the center aisle is used for assembling speed reducers. The heat-treating department is located just off one corner of the P.I.V. department proper, where it is conveniently near to handle the work rapidly, while still sufficiently isolated to separate it from the machining operations.

It will be noted on the layout that all aisles are plainly marked with white paint lines. This keeps them clear to insure uninterrupted transportation of the work through the shop at all times.

The view shown of the machining bay is looking from the final operation toward the first operation. In general the machines are placed so the work goes progressively from one to the next, with the castings and heavier parts on one side, and the wheel faces and smaller parts on the other. Complete crane service is supplemented by the use of electric trucks.

The same smooth work flow is continued through the assembly operation. Because of the wide variety of sizes, speed ranges and gear reductions, it is uneconomic to stock finished units. However, the parts are stocked, and the assembly department is planned particularly to reduce the time between receipt of the order and shipping of the units. For this purpose assembly operations are made progressive, and special care is taken to bring the parts close to the operators.

One way of doing this is by the use of some intermediate storage racks. When the foreman receives the bill of material for an order, he has one of his men collect all the parts needed from the main storage bins which may be seen in the illustration and transfer them to the intermediate bins which are located between the two rows of work benches. This arrangement means that the man actually at work on the assembly operation does not have to look around the shop to get the parts he needs or to select the particular sizes he wants from a large bin. Everything that goes with the order he is working on is centered at one point.

It will also be noted from this illustration that the gravity roller table in the foreground is used for the smaller P.I.V. units. Another table, in the background, is used for the heavier units, and over this extend two chain hoist monorails which permit turning over the casting in order to assemble the parts. A small drill press between the aisles serves for minor fitting operations. At the end of the bay, between the two rows of tables are the testing fixtures in which the units are given a power load before shipment. Because of the convenient arrangement for assembly operation and the proximity of the inventory of stock parts, it is possible to ship P.I.V. units in from one to five days from receipt of the order.

It will be noted from the plan view, that the spray painting department and the packing department are just off the end of the shop where the units leave the testing machines. These are so located that even up to the time of shipment a work flow is arranged to avoid back tracking and needless handling.

Perhaps the only thing that remains to be said is that a complete new heating plant has been installed, so that uniform control and circulation of the air in this department is maintained at all times. This additional precaution for the workers' comfort combined with cleanliness and convenience of layout induces careful and efficient workmanship.

DIE DESIGN and DIE MAKING

V—High production pierce dies require bushings for the guide pins, locating pins and pierces in order to maintain accuracy and output

E. G. MARSHALL

Master Mechanic, Charleston Works
The American Fork & Hoe Company

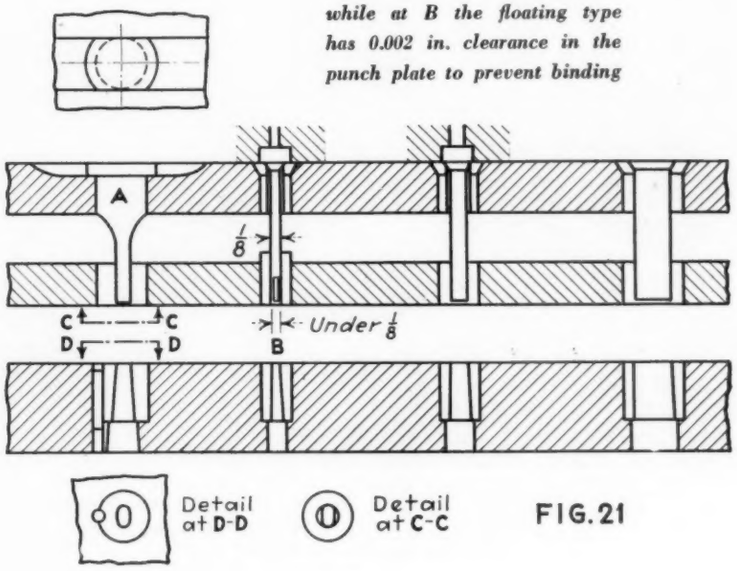


Fig. 21—At A is a rigid piercer, while at B the floating type has 0.002 in. clearance in the punch plate to prevent binding

FIG. 21

SO MANY different degrees of accuracy are required in mounted high-production pierce dies that the tool expense varies widely. At the lower end of the scale is the mounted pierce die with the holes bored directly in the die block, dispensing with inserts and bushings and with rigid unpiloted piercers in the punch plate. The most expensive type is one having inserts and bushings for all openings in the die block, and with floating piercers guided by pilot bushings.

In the case of a part with several large openings and small round holes it is well to make two dies. The first should pierce the large openings and the second the small holes. By so doing the accuracy of location for the small holes will be increased.

Before discussing the advantages and construction of several mounted pierce dies, certain ideas concerning piercers and locating pins will be taken up. The rigid type of piercer is shown at *A*, Fig. 21, while the floating type is illustrated at *B*. The second has several advantages. Among these is that the floating piercer is easy to replace when worn or broken, and that the punch plate, the stripper and the die block are bored at one setting and to the same diameters. At *B* is a piercer for a hole smaller than ⅛ in. To afford sufficient strength and to avoid breakage, the body of the piercer is never made less than ⅛ in. in diameter. Floating piercers have 0.002 in. play in the bushing in the punch plate to prevent binding during alignment.

When two or more parts are pierced in the same die there are cases when some holes are used in one part and not in the others. Fig. 22 shows two methods of pulling back the piercers not wanted. These piercers are of the floating type. The first method of pulling back is shown at *A*. It consists of two plugs having fine threads. These are adjusted for the required depth, the top one locking the bottom one. Plug *B* is of sufficient length so that the bottom end that takes the pounding of the punch head will not rise far enough to catch in the threads.

The second method of making piercer punches inoperative is illustrated at *C*. Here a tool-steel plate *D* is slid in and out from under the piercers. Plate *D* also acts as a backup.

Several types of locating pins are shown in Fig. 23. These are bushed in the die block. The advantages of using a bushing are: any wear or mutilation caused in driving the pin in and out can be corrected by making a new bushing; there is more room to get in with an internal grinding wheel if desired, and an eccentric bushing can be made in order to change the location of the pin.

The pilot pin shown in Fig. 23 is a so-called "fool-proof" design. It is a drive fit in the punch plate and is bushed in the stripper and the die block. This pilot pin cannot be put into the die in any but the correct way.

An example of an expensive and highly accurate pierce die is shown in Fig. 24. It is designed to pierce nine oblong holes in a flat cold-rolled steel plate ⅞ in. thick. It is of the guided type, tool steel inserts being used for the die block at *A*, the stripper at *B* and the punch plate at *C*, and into these are fitted hardened bushings for the piercers, as at *D*, *F*, and *H*; for the locating pins as at *I*, and for guide pins as at *K* and *L*.

Because of the small size of the piercers, only the holes for the pilot pins were bored through the punch plate, stripper and die block. The die block is made of machine steel, as all wearing surfaces are taken care of by inserts and the bushings mentioned. Thus, the fear of distortion of the die block in heat-treatment can be forgotten.

The die block is first shaped to size

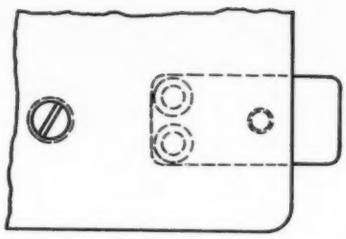


FIG. 22

Fig. 22—When a punch is not needed it may be made inoperative by screwing back on the threaded plugs A or pulling out the slide D

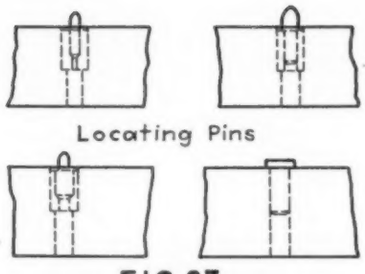
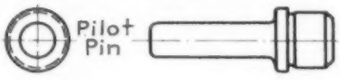
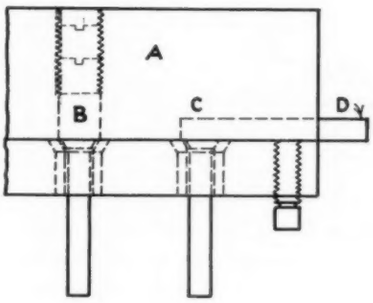


FIG. 23

Fig. 23—Locating pins, made in various forms, are preferably bushed





and the top is ground smooth for layout. Next the opening to receive the insert is laid out and end milled to the print size. Then the insert is machined for a light drive fit in the die block. Dowel and screw holes are put in the insert only, and the holes for the locating pins and the piercing holes are bored. The insert is removed and the straight sides of the slots are filed to size. The top portions of the piercing holes are made straight for ⅛ in. and the remainder given a ¼-deg. taper.

The insert is then hardened. It is driven back in the die block and the screw and dowel holes are transferred through the die block. Clearance holes for the slugs are drilled and filed in the die block. The advantage of using a bushing for the locating pin is now apparent and becomes more so when the pin must be driven in and out each time the die is sharpened.

On the upper member the pilot holes were bored with the die block. Pilot pins are now driven in the punch plate, and the lapped and ground bushings are driven in the stripper. These two plates are then clamped on top of the die block and located by the guide pins. The location for the inserts can be transferred to them. Then the openings to receive the inserts are machined out. After the inserts are driven into the stripper plate and punch plate respectively, each plate is attached separately to the die block and the piercing holes transferred. The inserts are then removed and hand filed to finish the holes. They are hardened and driven back in place. Piercers are machined to size and hardened and stoned. They can then be placed in the punch holder.

The assembled punch plate and stripper can be placed on the die block and the location obtained by the pilot pins. Place the punch holder over the leader pins in the sub press and after clamping the punch plate to it, remove

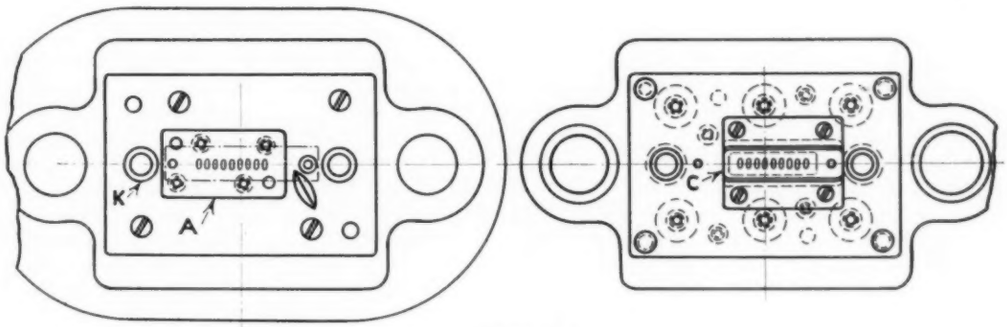
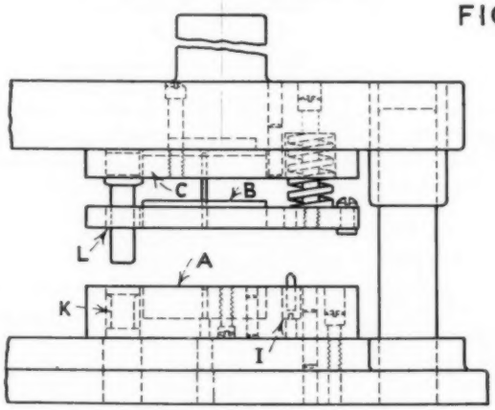
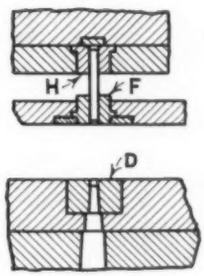


FIG. 24

Fig. 24—Tool-steel bushings are used for the piercers in the die block, stripper plate and punch plate





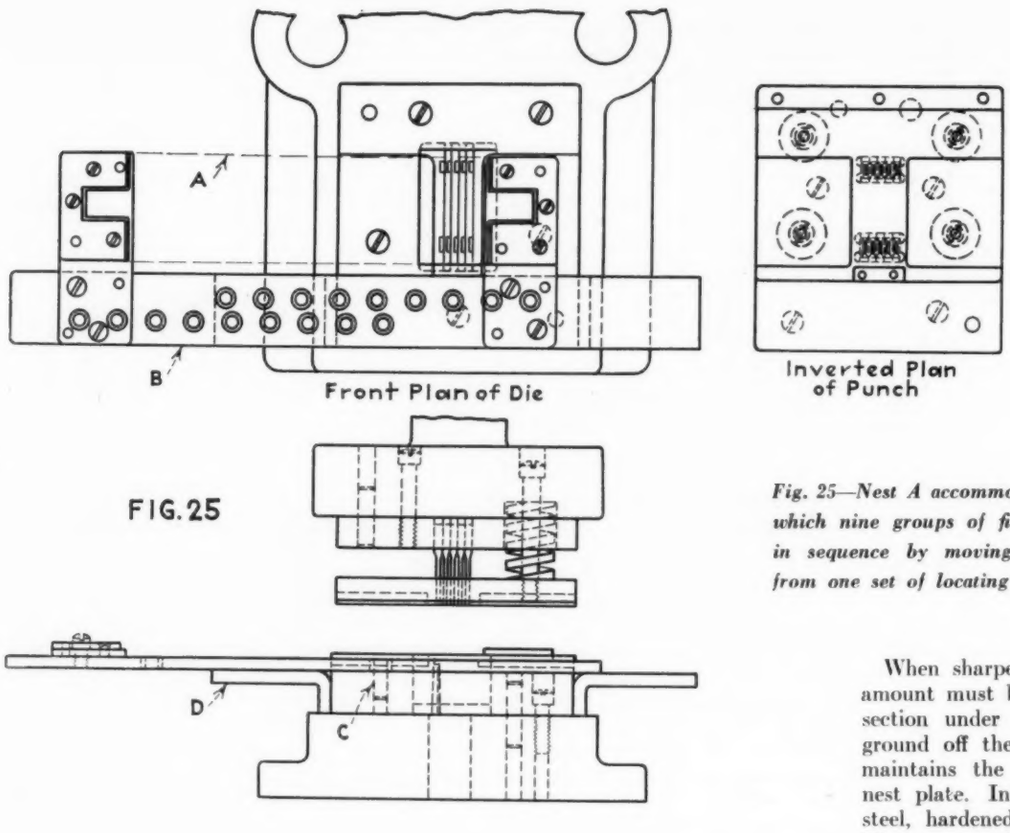


FIG. 25

Fig. 25—Nest A accommodates a long piece in which nine groups of five slots are punched in sequence by moving the locator bar D from one set of locating bushings to the next

to drill and ream the screw and dowel holes. The dowels should be a drive fit in both the punch holder and punch plate. Drill and counterbore the holes for the stripper springs and screws. It should be remembered that the stripper springs are to be assembled under an initial compression of ⅛ in. Four equalizer buttons are placed in the corners of the stripper so that the stripper cannot tilt to one side. These buttons extend beyond the stripper just the thickness of the stock. While they are drive fit, for safety's sake they should have a filister-head screw.

The thickness for the nest plate has been mentioned earlier (*AM*—Vol. 80, page 378). If the nest plate covers the entire die block, it will not be necessary to use equalizer buttons.

It has also been previously stated that the piercer must be made larger than the desired hole in order to obtain the correct size (*AM*—Vol. 80, page 377). In the case of slots such as being pierced in Fig. 24, make the ends of the piercers 0.001 in. larger and the centers 0.002 in. larger, depending on the length of the slot. It must be remembered that the slot spreads open and then closes in.

To save the expense of a large or complicated construction, pierce dies can be made to punch a section at a time. This is done through the use of moving locators. The only restriction is that all the holes or at least each group of holes must be alike. The locator can be made to move front and back or sideways.

There are many ways of punching holes in sections, but Fig. 25 is a typical example. This is a drawing of a mounted pierce die for slots. All told there are 45 slots in each row. Of course to pierce all 90 slots would take a die of very large area and heavy tonnage. It might pay to make such a die if the volume of production were large enough, but because only low production was required, it was decided to pierce five slots at a time and to have nine positions of the locator. The part is laid in the nest plate, shown at *A* and the moving locator *B* is moved until the locator pins *C* have been in each pair of bushings.

The die is mounted in a sub press with the leader pins at the back so as not to interfere with the movement of the part. The die block is made of machine steel and screwed and doweled to the die shoe. A rectangular hole is machined in the center to hold the inserts. Clearance is milled on each side to clear the moving nest plate, and a recess is milled across the front to support the moving locator bar.

When sharpening the die the same amount must be ground off the front section under the locator bar as is ground off the top of the die. This maintains the correct height of the nest plate. Inserts are made of tool steel, hardened and ground all over. They are made in sections to secure easier machining, and have a drive fit in the die block. A ⅛-in. sq. heel is placed on the bottom of the inserts to hold them in place.

Two dowel pins are fitted in the die block for the locator bar. These pins are made a drive fit in the die block and a slip fit in the bushings of the bar. The center to center spacing of the bushings is made to suit the spacing of the slots.

Support plates to hold the ends of the part and the nest plates are mounted on the ends of the locator bar. The nest plates only are case hardened. Brackets *D* on the sides of the die block are used to support the overhang of the locator bar.

The punch plate is made of cold-rolled steel, and in the center are two openings for the punches. The stripper is not piloted so that there is 0.010 clearance all around the punches. The stripper is milled out to clear the nest plates, and equalizer strips are riveted to it. Punches are made of tool steel, hardened and ground all over. The width of the punches is made equal to the spacing of the slots. Before assembling the die they are driven in the punch plate, entered in the die, and the punch plate is mounted on the punch holder to suit.

Part VI of *Die Design and Die Making* will be published in a forthcoming number.

Editorials

AMERICAN MACHINIST ESTABLISHED 1877
VOLUME 80 NUMBER 12
K. H. CONDIT • F. H. COLVIN
EDITORS

POLITICS AND EMPLOYMENT

POLITICIANS know that appeals to emotion are many times more effective than appeals to reason. In the coming campaign they are sure to talk of employment and recovery in terms that ignore facts. Lest he be carried away altogether by his emotions the voter in the metal-working industry should have the facts in the back of his mind. Some important ones have come to light lately.

I—In twenty-five manufacturing industries the National Industrial Conference Board finds that the purchasing value of the weekly wage is almost back to the 1929 level. Purchasing value is found by dividing the money value of the weekly wage by the cost-of-living index.

II—George A. Sloan, chairman of the Consumer Goods Industries Committee, reports a survey of representative industries to determine the course of working conditions. Improvement is general. Leading industries, such as petroleum refining, paint manufacturing, automobile manufacturing, report wages at 1929 levels. Others, notably meat packing, grocery manufacturing, rayon weaving, report higher wages, more people employed, or both.

III—The *American Machinist* index of industrial machinery orders is moving vigorously upward, may reach fifty per cent above 1935 level when May figures are in, was nearly there in April. This performance is an indication that the durable goods industries, laggard in recovery, are closing the gap that separates them from the consumer goods group. Here lies the hope of the metal-working voter.

That is industry's contribution to re-employment. Unfortunately no one knows how many were out of work in 1929—and no one knows how many are out now. It would not be good politics to have actual figures to spoil the emotional appeals. And it isn't so easy to define unemployment for an average census taker.

What we do know is that there must be more jobs now than there were in 1929, because there are more of us, which implies an increase in the number of job seekers. We know, too, that employment in industry —production, service or trade—is vital to recovery. Adding a man to the government payroll, *à la* Hopkins or *à la* Farley, may have distinct political advantages but it means that those who have private jobs are supporting him. In private industry a man must earn somewhere near his capacity. On made work he produces little or nothing to earn his pay, and taxes make up the balance.

PRIVATE business has done a good job in getting men back to work. It must do a better one to complete the job. If politics would help instead of hinder the task would be easier.

OBSOLETE INDUSTRY

MACHINERY BUILDERS owe Alfred P. Sloan, president of General Motors, a debt of gratitude for his bold statement on the obsolescence of industry in the course of his San Francisco speech. His remarks were a welcome antidote to the economic poison of President Roosevelt's Baltimore speech in which he upheld the traditional labor union philosophy of a limited amount of work which must be divided as equitably as possible among the workers. To be fair to union leaders it should be said that some of them no longer hold this philosophy today.

Mr. Sloan mentioned tax exemptions for amounts spent on modernization of industrial plant, the same expedient that was so successful in Germany two years ago. Jesse Jones, RFC leader, offered the same suggestion to the Senate Finance Committee in his testimony on the pending revenue bill. It was first presented to this same committee at the close of the previous Congress by L. C. Morrow, editor of *Factory Management and Maintenance*, on behalf of a group of business paper editors and publishers.

The only danger in this suggestion is that it would get out of control and swamp the machinery builders. The extent of plant obsolescence is so appalling that any effort to remedy a major portion of it at once would seriously embarrass equipment makers, already hard put to find the skilled men needed for their kind of work. Even the Germans had to withdraw their plan after a year for this very reason.

Under rigid control such a plan could be made to work. Its suggestion by men like Mr. Sloan and Mr. Jones is encouraging evidence that a bad situation is being recognized and that steps to overcome it are under consideration.

Chips

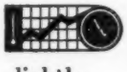
WASHINGTON — Congress struggles valiantly to clear the decks before the political conventions although the Guffey Act decision and the D. C. Supreme Court invalidation of Tugwell's resettlement work complicate matters . . . Dr. Townsend runs out on House investigators as questions get embarrassing, his aides refuse to testify, and all are cited for contempt . . . Social Security Board names 12 regional heads . . . New York judge finds clause in AAA prohibiting recovery of processing taxes unconstitutional . . . Eastern railroads enter suit to block fare reduction but start advertising to draw passengers and put new rates into effect . . . Senate Finance Committee refuses to write tariffs into the tax bill, then weakens . . . New engineering study of Florida canal and Passamaquoddy dams authorized by Senate Commerce Committee under administration pressure . . . New Guffey Bill on its way.

FOREIGN—Great Britain starts major defense program, first steps involve big orders for machine tools and manufacturing equipment . . . Austrian chancellor considers seizing munitions industry to block Starhemberg's backer who owns it . . . Soviets decline to limit naval building so long as Japan is free to build as much as she pleases . . . Military party wins over industry in Japan, gets nearly half of big budget . . . Britain takes notice of Italian anti-British propaganda broadcast in native tongues of Palestine and India . . . Arab rebellion in Palestine growing in seriousness . . . Spread of French strike closes several munition and automobile plants.

FINANCE — Treasury will borrow two billions June 1 . . . 82 economists advise Congress to stop silver buying, repeal act authorizing purchases . . . Earnings of Class I railroads best in five years.

INDUSTRY — Railroad executives and brotherhood chiefs agree on means of protecting men displaced by merging of facilities . . . Lewis demands action on plan to organize steel industry, A F of L orders his groups to dissolve . . . Chrysler Canadian plants raise pay 5 per cent . . . Carnegie-Illinois lifts third quarter steel prices, other producers follow suit . . . Several railroads prepare to order rolling stock . . . General strike called at six Remington-Rand plants . . . Three-millionth Ford V-8 comes off the line as the Fords, father and son, look on . . . Lackawanna car repair shops move up from three days a week to full time . . . Eastern seamen's strike on the wane . . . Glass bottle craft union wins over new Lewis industrial union group in Pittsburgh election . . . Clothing workers vote to support Lewis, ignore Federation order.

TRADE—Inability of Japan to promise control of certain textile shipments to U. S. forces increase in U. S. tariff on these items . . . Adverse export balance continues for third month . . . Automotive chiefs urge Republicans to accept Hull theory of reciprocal tariff treaties . . . State Department considers counter moves against trade discrimination policies of Japan, Brazil and Australia.



INDICATORS—Steel production passes peak . . . Electric power output off slightly . . . Business Week's index remains steady

Conference Board Considers Social Progress

Speakers Discuss Freedom in Research, Religion, Business, Government and Education . . . Virgil Jordan Continued as Chief Executive of Board

Dr. Virgil Jordan, who was re-elected president of the National Industrial Conference Board at its 20th Annual Meeting in New York, May 28, set the keynote of the five addresses as follows:

"Liberty is not granted us by grace of governments, constitutions, courts or Congresses, nor can we depend upon them permanently to preserve and protect it for us. It does not prevail or persist by the power of political traditions, parties, personalities or laws. Liberty springs solely from the spirit of those common citizens who have the will and the courage to create it for themselves, the strength and integrity to accept its responsibilities and pay its price, the valor, vigilance and fortitude to defend it even with their life against its unseen, incessant, and insidious enemies—indifference, ignorance, indolence and injustice. Save as it is more precious to us than prosperity, peace, comfort or security, it will never exist or long endure among us. Every man in each generation must renew and replenish its spirit in himself, and no man nor any group can demand it for themselves and deny it to others without destroying it for all.

"It is clear that if we are to preserve and develop the American conception of social progress, the institutions of free search for the truth, of free faith, free enterprise, free government, free education must be uncompromisingly preserved. They are the foundations upon which we must build for the future. That is why this Twentieth Annual Meeting of the Board is devoted to discussion of them, and of their place in the American program for social progress."

Science is Pioneering

In the course of his remarks on the value of research to social progress President Karl T. Compton of Massachusetts Institute of Technology said:

"The geographical pioneer is now supplanted by the scientific pioneer, whose thrill of discovery or urge for reward is no less keen and whose fields of exploration are probably unlimited. Without the scientific pioneer our civilization would stand still and our spirit stagnate; with him mankind will continue to work toward his higher destiny. This being so, our problem is to make science as effective an element as possible in our American program for social progress."

Ralph E. Flanders, president, Jones & Lamson Machine Co., and past president, American Society of Mechanical Engineers, speaking for freedom of opportunity for business and industry, attacked the question from three aspects, the customer's interest, the employee's interest and the investor's interest. Extracts from his remarks follow:

"We are fascinated by the various medicines offered for the cure of our economic ills. We try something. If it works we try it some more. If it doesn't work we stop that and try something else. Unlike the research scientists in the field of medicine, instead of trying it on guinea pigs first, and then on monkeys, and finally and with great caution working up to a trial on a few human beings—instead of following this sober procedure we apply our suddenly conceived economic remedies to the whole mass of the population at once. We have had to be our own guinea pigs and our own monkeys, one hundred and twenty-five millions of us at once. . . .

"The necessity for profits is something that we should understand. For a business to be healthy, pay good wages and maintain employment, it is necessary that there be a sufficient margin of selling price over direct costs to cover at least the following expenses: There must be funds available not only to repair equipment and machinery, etc., but to replace it when worn out. There must be enough to replace it before it is worn out if new and improved machinery appears which competitors could use and thereby drive our company out of business by their lower costs. There must be profit enough to permit the necessary surplus for carrying the working force over bad times so far as this is possible. Unless profits are great enough to permit these things to be done, the employees of a company will find themselves in the service of a dying business, and they will be out of work when they most need work and wages. . . .

Re-elected President

VIRGIL JORDAN

Workers and Profits

"From the employee's standpoint the most important essential is that he be employed by a profitable business. If he is not, he can have no hope of an increasing share of the material goods of life. If his industry is a dying one, any increased demands he makes on it will only hasten its demise. The worker is vitally concerned with the prosperity of his employer, of his industry, and of business as a whole. Only when all are profitable and expanding can he hope for a reasonable share of the goods and services produced; and when they are profitable and expanding the demand for his services will be such that increased rewards will come easily and without conflict."

Bishop Francis J. McConnell spoke on religion in social progress, Hon. Charles Nagel on government, and Chancellor Harry Woodburn Chase, of New York University, on education.

John Henry Hammond of the law firm of Hines, Rearick, Dorr & Hammond, and President of the Bangor & Aroostook Railroad Company, was elected Chairman of the National Industrial Conference Board. The following Vice Chairmen were elected:

Irénée du Pont, Director, E. I. du-Pont de Nemours & Company, Wilmington, Del.; Hon. Walter J. Kohler, President, Kohler Company, Kohler, Wisconsin; E. Kent Hubbard, President of the Manufacturers Association of Connecticut, Hartford, Conn. Fred I. Kent, Director of the Bankers Trust Company, was re-elected as Treasurer of the Board.

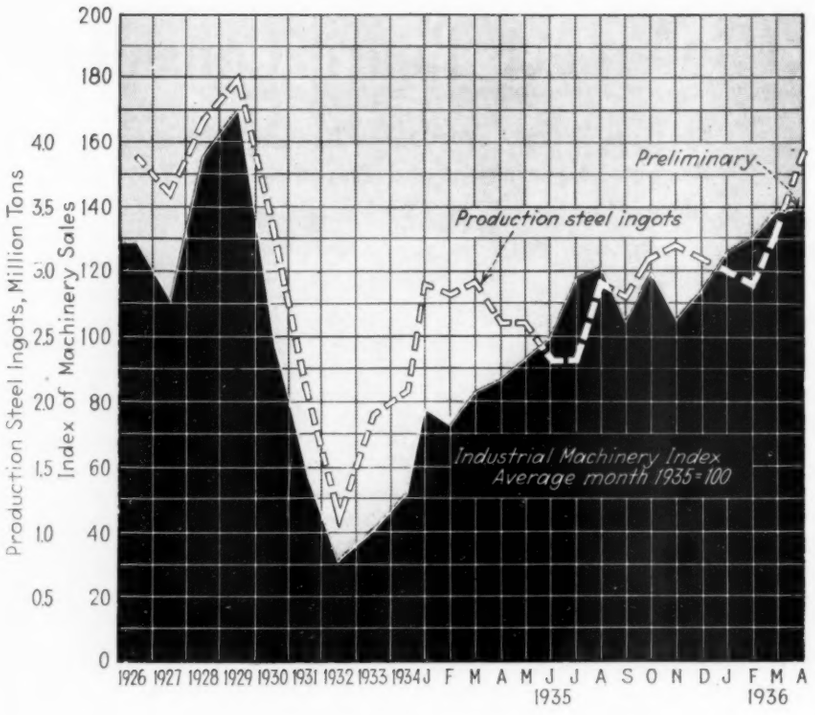
Sales Indexes Move Up

Clear proof of the improvement in the metal-working industry this spring is given by both the industrial machinery orders and shop supply sales curves. Their upward trend is followed by steel ingot production as reported by the American Iron & Steel Institute, which was chosen as the comparative index to go along with our own computations in this issue.

Going back ten years with steel and machinery orders curves one can't help but be impressed by the agreement between the two sets of statistics represented by the curves. This correlation gives further proof of the value of steel production statistics as an industrial indicator.

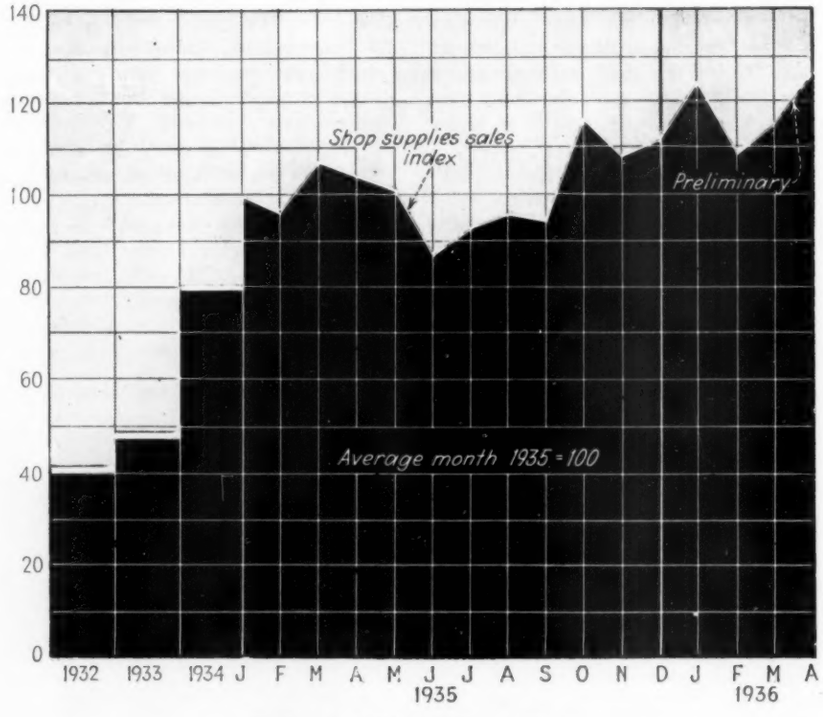
Until the two *American Machinist* indexes are somewhat older than they are now, and we have more experience with the factors included in them, preliminary figures will not be as faithfully indicative of trends as they might be. This is not a serious matter with the shop supply sales index because only one factor arrives too late to be included in the estimate. With the machinery sales index, however, several of the factors come in so late that the preliminary figure has been affected. In each case it has been a number of points lower than the final figure, as close students of this index have doubtless noticed.

When we have a bit more experience it should be possible to correct for this difference and bring the preliminary estimate more closely into line with the final calculation.


Production Steel Ingots, Million Tons
Index of Machinery Sales
Preliminary
Production steel ingots
Industrial Machinery Index
Average month 1935=100
1926 1927 1928 1929 1930 1931 1932 1933 1934 J F M A M J J A S O N D J F M A
1935
1936

Orders for Industrial Machinery

Factors missing when the March preliminary figure was estimated brought it up to 139. April will set a high record if the same situation holds



Sales of Shop Supplies

Preliminary figure for April shows a sharp upward swing after two months at about the same level

BUYS DRILL COMPANY

Whitman & Barnes Takes Over Alliance Twist Drill Factory

The Buckeye Twist Drill Co., Alliance, Ohio, has been purchased by Whitman & Barnes, Inc., Detroit, and the plant will soon be opened. Part of the plant is being remodeled and new machinery will be installed. The monthly payroll is expected to be about $20,000, according to William B. Fetner, of Whitman & Barnes.

$100,000 EXPANSION .

Oil Well Machinery and Gas Engine Maker Is Adding to Toledo Plant

National Superior Co., Toledo, subsidiary of National Supply Co., makers of oil well supplies and of gas engines, has begun work on a new plant addition to cost $100,000.

Watching Washington

Wind-up at Washington may be delayed because of split over tax measure... Spirited spending makes budget balancing remote as ever... Surprise move may revive Walsh Bill provisions . . . Revised Guffey Bill finds few friends

WASHINGTON—Few functions of government are more far reaching than that of taxation. Directly or indirectly taxes affect every man, woman and child in the country; yet we witness the current spectacle of an ill-planned piece of revenue raising being pushed through to release legislators for their political conventions.

Because of the President's fondness for injecting "reform" principles into vital pieces of legislation the measure was inaugurated without sound fiscal foundation. The Treasury, which has devoted practically all its attention to borrowing technique was unprepared and seemingly unable to present a coherent background upon which an adequate bill could be framed. The House docilely accepted a plan that has since been proved to be about as poor a piece of legislation as the country has seen—and it has had plenty of competition in this direction.

Compromise Evolved

At the risk of incurring Presidential ire, the Senate Finance Committee evolved a compromise measure which at the present writing includes:

A one per cent increase in individual surtaxes in the bracket between $6,000 and $50,000.

A step-up of corporation income taxes to a sliding scale of from 15½ to 18 per cent as compared to 12½ to 15 per cent in the present schedule.

A flat 7 per cent surtax on undistributed corporate profits.

Application of the normal individual income rate of 4 per cent to dividends in the hands of stockholders.

An 80 per cent "windfall" tax on "unjust enrichment" resulting from the return to processors of impounded AAA processing taxes.

With the "double tax" on earnings and dividends, stockholders in large corporations will pay the government at least 22 per cent. If the earnings are not divided the year they come in, this percentage will be still greater under the soak-the-surplus provision.

Constitutionality of the last named clause, that affecting companies and individuals who successfully fought collection of the illegal processing taxes, is extremely doubtful. It involves direct discrimination, since its purpose is not to raise revenue but to levy a penalty. If this section of the bill is passed and upheld, a taxpayer who exercises his rights by challenging a law might just as well save his legal fees because the government can assess him the amount of the illegal tax in the next bill it passes.

Planned adjournment of Congress on June 6 is threatened by doubt as to whether the President will accept the Senate measure with its compromise surplus clause. Last week in a night parley he made new demands on the committee for retention of the drastic provisions incorporated in the House bill. Political pressure and anxiety to adjourn may yet leave the way open for restoration of the most undesirable features of the tax program.

Half-Baked Bill Certain

Only one thing is certain—a half-baked bill will issue from the conference between the two Houses. There is small comfort to industry in paying so drastic an impost when it is evident that little progress will be made toward balancing the budget. Totaling over $2,000,000,000, the largest peace-time government financing was announced by Secretary Morgenthau for June 15. The forthcoming bond issue, largest since the Victory Loan of 1919, boosts the public debt to a new high of more than $32,000,000,000.

Last week the Senate Appropriations Committee reported out a deficiency bill which would overnight transform $1,425,000,000 of relief money into a drawing account for President Roosevelt. The purpose is to keep free these funds if the delegated authority granted WPA by administrative order should prove unconstitutional. Imbedded in the hearings on this bill was full information on how much it costs Dr. Rexford Guy Tugwell to "resettle." The top is $20,250 a family spent in a project for thirteen families at Sioux Falls, S. D. This the doctor admitted was high but $11,940 per family seems permissible as this is to be allowed for a contemplated project at Osage Farms, Mo.

Earnings Down the Funnel

Privately, tax experts agree that if Federal relief spending continues, only LaFollette's plan of going after small incomes or a general sales tax can prevent inflation. Small wonder that business resents the prospect of pouring additional earnings down the funnel of futility.

Revival of the Walsh-Healey measures to restore NRA wage and hour provisions for government contractors and their sub-contractors was threatened in a surprise move contained in a seemingly harmless proposal by Congressman Citron. Innocuous in itself this bill if passed would mean that it would go to conference with the Walsh bill already passed by the Senate and might finally result in damaging legislation. When the Healey bill was tabled by the House Judiciary Committee, the measure appeared to be dead.

Shorn of Labor Sections

Stripped of its labor sections the revised Guffey bill does not appeal to many who voted for the statute the Supreme Court found unconstitutional. Even its friends admit that unless the measure enlists full Presidential influence it will not pass. Many proponents of the original measure object to price fixing for the coal operators if there is nothing in it for labor despite the "chaotic" condition cited by the House Ways and Means committee in reporting out the bill. Removal of the labor sections is the only important change in the new measure. An effort to drag in something of advantage to labor is the statement that it is the policy of Congress to encourage collective bargaining and that labor should have the right to bargain through representatives of its own choosing. This section has no binding force. It is

just strong enough to irritate opponents and too weak to please its advocates. The Guffey decision seems to foreshadow the doom of the National Labor Relations Act which would strip such a paragraph of any significance it might have otherwise.

By a 271 to 41 vote the House put the finishing touches to the Townsend bugaboo. With Townsendism already on the wane, there was little need to vote to prosecute the misguided doctor. But Congressional dignity was injured when Townsend walked out on the investigating committee and told his aids to refuse to testify. Besides it's fun to kick a man when he's down, particularly if you were afraid of him at one time or another.

Auto Factory Payrolls Highest Since 1929

Average Pay Reaches $32 per Week; Stability Increased in Vehicle Industry

Automobile manufacturing plants last month paid out the highest weekly payrolls since 1929.

The April figure was $11,600,000 a week, an average of $32 per employee. This compares with an all-time peak for the automobile industry of $35 in the Spring of 1929.

This new wage peak in the automobile industry was the result of high hourly earnings plus steady employment. Recent average work hours per week were 10 per cent below those of the peak of 1929 and approximately unchanged from the Spring of 1935.

April employment reports showed continued stability in number of men at work which has been manifest since the beginning of 1936 production. The total of employees was 363,000.

HIT NEW RECORD

Refrigerator Sales Reach New High In April; Near 300,000 Units

An all time monthly high for domestic electric refrigerator sales was established in April with a total of 276,721 units in the United States, 3,918 in Canada and 18,578 in other foreign countries, aggregating 299,217.

Sales for the first four months reached a new record at 796,294 for the United States, 7,953 units for Canada, 50,656 units for the rest of the world, a total of 854,903 units.

World sales in April had a value of $24,272,697 and the four months $69,519,281, against $19,605,563 and $52,582,930, respectively, last year, and $20,007,003 and $41,016,633 in 1934.

Forging Practice In "Bow and Arrow Age"

R. E. W. Harrison Cites Reason for Higher Costs, and Says Casting Is Winning

The metal-working industries are "still in the bow and arrow age" of forge-shop practice, R. E. W. Harrison, vice-president, Chambersburg Engineering Co., Chambersburg, Pa., told the Detroit Chapter, American Society of Tool Engineers, May 14. Eighty-five per cent of forging machines are more than 10 years old, he pointed out, quoting the *American Machinist* 1935 inventory of metal-working equipment. Sixty-five per cent of all machines used in the metal industries are more than 10 years old.

This obsolescence of machinery, which makes operating costs high, is the reason, he said, that casting technique has replaced forging to a certain extent.

There is a trend toward using heavier tools in the newer steam hammers, Mr. Harrison said, to complete the work with the minimum number of blows and in the minimum time.

A problem in making these machines is to take care of the dissipation of unused energy without damage to the equipment. Hence, in the last decade, the ratio of the anvil weight to the weight of the falling parts has been increased from about 7½ to 1, to 25 to 1, assuring better rebound of the hammer.

With hammers of this type, he said, dies of 3 deg. draft instead of the usual 7 deg. type can be used, making possible a reduction of from 60 to 70 per cent of the amount of metal needing to be removed in machining operations.

Huge power losses are directly attributable to worn machines. A 2,000-lb. hammer, he said, which consumes 3,550 lb. of steam per hour when in good condition, might use as much as 5,650 lb. per hour when in poor condition, a power loss of 2,100 lb. per hour.

Improvements in die cutting practice, including the use of better grades of alloy steels, allow as much as 60 per cent more forgings before recutting the impression is necessary.

A survey of more than 500 forge shops has convinced Mr. Harrison of the necessity for up-to-date handling equipment. Often forgings are thrown upon the earth floor, the first few getting water-quenched from puddles, and the top ones getting air cooled. Those in the middle of the pile are annealed.

"No one thinks of putting conveyors in a forge shop, although all other departments may be so equipped," he said, advocating some simple forms of conveyor for this type of work.

Furnaces, he found, are usually too small and insufficient care has been taken of their insulation. Loose refractory bricks is a quick way to "burn up money," he said, and if a furnace is too small the work cannot be uniformly heated through, resulting in external strains of the part.

BUYS INTEREST

Bendix Aviation-Jaeger Deal Assures Cooperation on Instruments

Bendix Aviation Corp. has purchased a substantial interest in the Jaeger Watch Co., New York. The development will assure cooperation in design and manufacture of precision instruments between Jaeger in New York, the Pioneer Instrument Co., a wholly-owned Bendix subsidiary, and the Jaeger Co. of France and Switzerland.

MINERS WANT MACHINES

Mechanization Makes Workers Happier, Coal Executive Says

Mechanization of the mining industry in the United States was the central theme of a four-day meeting of the American Mining Congress, held recently in Cincinnati.

"Machines improve working conditions in mines, and miners are happier and more contented when given power tools to work with," L. M. Thomas, Carbon Fuel Sales Co., Charleston, W. Va., told the convention, which was attended by more than 5,000 mining executives.

An exhibit of mining tools, valued at $2,000,000, was a feature.

GERMAN TOOL SALES UP

Leipsig Fair Credited With Increase in March Machinery Sales

The Spring Fair in Leipsig, Germany, stimulated German machine-tool and machinery business, with gains reported for both domestic and export sales for March, as compared with the preceding months, the U. S. Department of Commerce reports.

TO MAKE OWN AXLES

Pontiac Is Spending $6,000,000 On Expansion Program

Pontiac Motor Co. is installing machinery to make all axle requirements for the company and part of those needed for another General Motors division. Machinery required will make up major part of $6,000,000 expansion program now under way.

Pacific Coast Sees Industrial Expansion

New General Motors Los Angeles Plant Boosts West Coast Plant Outlay to $50,000,000

Dedication last week of General Motor's Southern California assembly plant at Los Angeles, which will turn out 40,000 Oldsmobiles, Pontiacs and Buicks a year, marks a spectacular advance in the trend of manufacturing toward the Pacific Coast. Accelerated recovery has established scores of new factories on the coast during the past five years.

Willys-Overland started a Los Angeles plant in 1928, Ford Motor Co. went to Long Beach in 1930, and Chrysler followed in 1932. Last year these companies produced 86,000 cars and trucks, and this year will turn out more than 100,000. Studebaker, which established a plant there this year and the new General Motors factory will add 35,000 to the total this year.

Less than a year old, the Studebaker plant will be doubled soon with a body plant and adding to the assembly building. Facilities will allow the production of 100 cars a day, supplying Western states dealers and a part of the Far Eastern export requirements.

Plymouth and Dodge output in Los Angeles reached 43,000 last year, and with a capacity of 300 cars a day, is expected to exceed any year since the plant opened in 1932.

Although Oregon and Washington have benefitted by the industrial move westward, chief activity has occurred in the Los Angeles area, where 23 branch units of national companies, at an investment of $10,400,000, have been added. An additional $6,075,000 has been spent in additions and expansions.

All industry, both national and local, have invested about $50,000,000 of new capital, making Los Angeles second to Detroit in the automotive field, and with San Diego, leads in aircraft manufacture.

The Chevrolet plant at Oakland has a capacity of 90,000 a year, and Fisher Body Corp. has a plant in connection with this General Motors unit. A Fisher Body woodworking plant at Seattle, and several General Motors warehouses along the coast have added to the Coast's industrial expansion.

With the new L. A. Young Spring & Wire Corp.'s $250,000 plant, and the building last year of the General Spring & Bumper $250,000 factory in Los Angeles, more than 60 manufacturers of automotive and allied products are in or near that city now. The value of their products in 1935 reached $8,000,000. In addition, there are on the coast 57 manufacturers making automobile replacement parts and accessories, although most of these are small factories.

Ten major aircraft plants have been established on the West Coast in recent years, and six of these have seen plant expansions this year. Unfilled orders of these plants are more than $39,000,000. The California climate allows uninterrupted production and testing, and eliminates need of heating huge hangars and assembly plants.

EXPANDS AGAIN

New machinery and building, to cost about $250,000, comprises the second recent expansion of the Bantam Ball Bearing Co., South Bend, Ind.

IS CHIEF ENGINEER

National Tool Co. Appoints E. J. Lees Head of Engineering Work

E. J. Lees, formerly of Lees-Bradner Co., a pioneer in designing heavy milling machines and an authority on gears and gear making machinery, has been appointed chief engineer of the National Tool Co., Cleveland.

PLAN MORE FACTORIES

New York Manufacturers File Record-Breaking Volume During Month

The largest number of plans for industrial buildings in the 12 years such records have been kept were filed with the industrial commission of the state of New York in April, with a total esimated expenditure of $947,350 for the 115 projects. It represents a gain of 12 per cent over March of this year, the commission reported.

Industrial Review

• MAY WAS A SATISFACTORY MONTH for distributors of machinery and machine tools in most parts of the country and June is opening up with very fair prospects. About the only serious labor disturbance affecting the machinery industry has been the tie up of Remington-Rand plants in several states. Foreign business has been growing steadily in volume for a number of companies and has reached appreciable proportions. English buyers have been in the market for machine tools in connection with the augmented defense program and have taken a number of used machines.

•IN THE EAST, New England reports for May business vary from "best month in the year" to "plenty of activity but orders are hard to close." New York reports plenty of activity but some hesitation in closing, volume reasonably good. Conditions in Philadelphia are fairly good, inquiries being brisk and orders not far behind. The general situation is reported as being very hopeful in Pittsburgh, inquiries being active and orders for individual machines in fair volume.

• CLEVELAND machinery men report growing difficulty in meeting early delivery dates. Lack of needed skilled men for extra shifts is held responsible. Strikes in Akron and Kent, Ohio, are disturbing elements. Remington-Rand's plant in Norwood, Cincinnati, is closed but that is the only adverse factor in the general situation there. May saw some recession in orders for some plants but better business for others. Prospects are good. In and around Indianapolis the situation remains about as it has for several months. A normal summer business is anticipated.

• MACHINE TOOL BUSINESS is definitely on the increase in Detroit, although motor car shipments are dropping seasonally. Supply business is decidedly satisfactory. Most of the machine tool orders are for special equipment. In Toledo long range possibilities are somewhat better than the more immediate ones. June is expected to be a good month. Local plants are busy. Chicago and Milwaukee are free from labor trouble and skilled help is desperately hard to get. Milwaukee in particular is enjoying prosperous times for the metal-working industry. Live inquiry is increasing in and around St. Louis which encourages hope for the future. Actual orders have remained on a relatively steady basis for a number of weeks. Skilled men are extremely scarce. Reports from the Pacific Coast are encouraging. The expectation is for a reasonable volume of business during the summer.

October Is Set For S.A.E. Aircraft Production Meet

Los Angeles Sessions Headed by Carleton E. Stryker

The first production meeting ever held by the aircraft industry will take place in October in Los Angeles, under the sponsorship of the Society of Automotive Engineers, Inc., John A. C. Warner, secretary and general manager announced.

Carleton E. Stryker, chief engineer, Curtiss-Wright Institute of Aeronautics, Glendale, Calif., has been appointed general chairman of the meeting, which will last several days. Mac Short, vice-president and chief engineer, Stearman Aircraft Co., Wichita, Kan., and Opie Chenoweth, resident engineer, U. S. Army Air Corps, Dayton, Ohio, vice-presidents of the Society, are heading up the plans.

Preliminary plans for the production meeting were made recently during a trip of Ralph R. Teetor, president of the Society, William B. Stout, past-president and Mr. Warner to the Pacific Coast, where they met a group of the aircraft industry's leaders in that section.

I.H.C. WORKS HEAD

C. R. McDonald Elected Vice-President in Charge of Manufacturing

C. R. McDonald has been elected vice-president in charge of manufacturing of International Harvester Co., Chicago, succeeding A. A. Jones, who recently retired. For 41 years an employee of the company, Mr. McDonald has been manufacturing manager since 1929.

WILLIAM BUTTERWORTH

Deere & Co. Chairman, Former U. S. Chamber Head, Dies

William Butterworth, chairman of Deere & Co., farming machine manufacturers, and a former president of the Chamber of Commerce of the United States, died of a heart attack at the Seaview Golf Club, Absecon, near Atlantic City, N. J., May 31.

He was elected head of the Deere concern in 1907.

SILVER BAY

Industrial Conference, Aug. 19-22, Will Discuss Human Relations

The Nineteenth Annual Conference on Industrial Relations will be held from August 19-22, at Silver Bay, Lake George, N. Y., E. C. Worman, executive secretary, 347 Madison Ave., New York, announced. The conference is conducted by the Industrial Department of the National Council of Y.M.C.A's.

"Planning for Statesmanship in Human Relations in Industry" is the general topic, and sessions will be held on Social and Economic Obligations of Industry, Social Security Legislation Problems, Current Industrial Problems, and Thrift Plans.

HEADS MACHINE WORKS

Former Chief Engineer Elected President of Morris Machine Works

Carl Lager, formerly chief engineer of Morris Machine Works, Baldwinsville, N. Y., has been elected president of the company succeeding the late Windsor Morris. Pierce J. McAuliffe has been elected vice-president and general manager.

FOUNDRYMEN ELECT

Gray Iron Founders Choose Machine Manufacturing Executive

Peter E. Rentschler, Hamilton Foundry & Machine Co., Hamilton, Ohio, was elected president of the Gray Iron Founders' Society, Inc., May 5, in Detroit. W. W. Rose continues the society's secretary, Cleveland.

AIRTEMP TO DAYTON

Air Conditioning Concern to Occupy Idle Maxwell Plant; Tooling Under Way

Airtemp, Inc., Chrysler division manufacturing and selling air conditioning equipment, will move to Dayton, Ohio, early in June, where it will occupy the renovated and modernized Maxwell plant of Chrysler Corp. which has been idle recently. Tooling of the new factory is now under way. Production heretofore has been carried on at the Dodge Division in Detroit.

L.O.F. GLASS EXPANDS

$700,000 Program Begun by Toledo Glass Manufacturer

Libbey-Owens-Ford Glass Co., Toledo, is spending $700,000 in expanding facilities at its Rossford and East Toledo plants. At Rossford six overhead electric cranes will be installed.

SET RECORD

Factory shipments of washing machines in March set the all-time record with a total of 170,176, or 30,433 more than in March, 1935, J. R. Bohnen, secretary, American Washing Machine Manufacturers Association, announced. Ironer shipments broke all records with 20,295, against 12,945 shipped from factories during February of this year.

Refrigeration Standards Program Is Progressing

Association Approves Report of Committee

Standardization work carried on by the Refrigerating Machinery Association during the year was reported on at the annual meeting of the organization, May 14 to 16, at Hot Springs, Va.

All types of commercial and industrial refrigerating equipment is embraced in the work, headed by S. E. Lauer, vice-president, York Ice Machinery Co., York, Pa., chairman of the association's standards committee. The association adopted a recommended standard form of guarantee and rules for testing, and rating mechanical condenser units.

KOEGLER HEADS DOEHLER

Vice-President Becomes President; H. H. Doehler is Elected Chairman

F. J. KOEGLER, formerly first vice-president, was elected president of Doehler Die Casting Co., Toledo, May 19. H. H. DOEHLER, formerly president, was elected chairman of the board, and will make his headquarters in New York. L. H. PILLION was elected executive vice-president, R. BERNHARD was named treasurer and F. KNOEBEL was elected secretary.

METAL SHOW BOOMING

115 Companies Have Reserved Space, Setting New Record for Exhibit

Eighty-five per cent of the exhibit space in Lakeside Exhibition Hall, Cleveland, has been contracted for by 115 exhibitors for the eighteenth Annual National Metal Show, Oct. 19 to 23, W. H. Eisenman, secretary of the American Society for Metals, sponsors of the event, announced.

Never in the history of the exhibit, he said, has so much space been taken in so short a period.

ADDS TO PLANT

Unitor Corp., Detroit, is remodeling its plant and installing machinery for the manufacture of the Unitor in the household appliance field.

MOLYBDENUM FACTORY

Climax Molybdenum Co. of Michigan is to erect a factory and laboratory building on Woodrow Wilson Avenue in Detroit.

Motors AND OTHER MATTERS

Rumor says G.M. to try automatic transmission . . . Big year for steel tops . . . Small car talk persists . . . Tool buying heavy . . . Economy is new goal . . .Willys and Hupp comeback is expected . . . Output tapering

BURNHAM FINNEY
Western Editor

DETROIT—This is the season of the year when car manufacturers are busy trying to find out what their competitors intend to do regarding new models. While final decisions already have been made so far as general styling of 1937 cars is concerned, the door is still open in most companies to slip in new features in an attempt to wrest sales from the other fellow.

One of the General Motors divisions, for example, is reputed to have suddenly adopted an automatic transmission in the last week for its forthcoming series and is said to be in the process of buying considerable equipment for its fabrication. This will be in the nature of a trial horse, with other GM units standing by to see what success is attained. If the public goes for the cars with automatic transmissions, all GM lines probably will have them in 1938.

Admittedly much experimenting is being done by many companies in eliminating the traditional shifting of gears, but the industry can't work itself into a lather of excitement over the possibilities for automatic transmissions the coming year. There is always a chance that someone will ballyhoo this feature so strongly that competitors will come hustling along with it too, but observers will tell you that experience with automatic transmissions thus far hasn't been happy. It will be surprising if the industry should plump for it in 1937, except in a few special cases.

More Steel Tops

The steel top will come into its own in a big way. There probably won't be a single car without it. Almost all companies will stamp out in one piece the top part of the car extending from the cowl back to the lower part of the rear window. This means that sheets will be used 68 to 70 inches wide and 130 to 160 inches long. Body panels in some cases may be slightly larger one-piece stampings than at present, but will not require as large sheets as the car top. At any rate, sheet mills capable of rolling wide sheets ought to make a killing next year.

Small Cars

Reports will not down that a prominent car maker is intending to bring out a small car to sell around $400 to $425 and that it has purchased equipment to machine the motor. It will continue, of course, its regular line of cars, which will constitute its major production volume unless the small series should prove a phenomenal success. Competitors are said to be watching this development closely and will be prepared to offer stiff opposition.

One company, which has been having trouble with oil-hardened alloy steel transmission gears, has decided to go over to case-hardened gears for 1937 and now is in the process of working out specifications for the most suitable kind of alloy steel for the job. As soon as the steel is determined, some equipment purchases will be made to handle this job.

General Motors divisions have been heavy buyers of machine tools lately, much of the machinery being of a special nature. Chevrolet, Buick, Pontiac and Saginaw Steering Gear have been among those placing orders. Object of the expenditures is to expand production and at the same time lower unit costs. It is understood that all GM companies will diamond bore both connecting rods and pistons the coming year.

Packard is fairly well along with preparations for its six to be presented in the fall, although it must purchase a few more machine tools before its buying program is completed. Its new cylinder block line will be one of the best in the industry. An innovation will be the broaching of large cylinder block surfaces for the first time.

All manufacturers are devoting increased attention to ways and means of getting more economical performance with their cars. While "Boss" Kettering laughs heartily and disbelievingly at the story that a carburetor has been invented which will make it possible to drive 200 miles on a gallon of gasoline, nevertheless the industry knows that a wide open market exists for any manufacturer who can materially better the economy records of present-day automobiles. There is the authenticated story of the car owner who put a special gearing on his low-price car, thus stepping up the gear ratio, and doubled the mileage he got out of gasoline. Of course, he sacrificed some of the quick get-away which most companies advertise, although few people really need it.

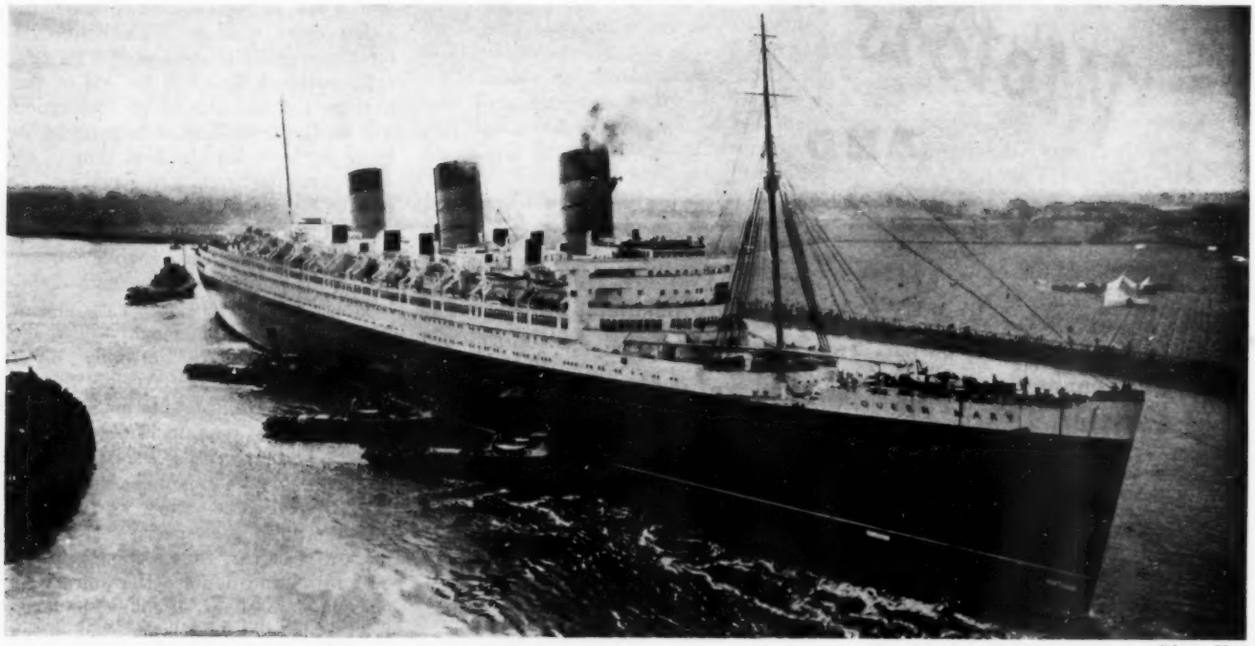
"Economy Motor" in Prospect

One class of buyer which insists upon economy first and racing characteristics last is the fleet operator. To secure this business one of the leading car makers is equipping its standard line with an "economy motor." As one executive said, "the motor is controlled externally and internally so that it hasn't much pep and can't be driven at excessive speeds, but is cheap to operate." This line has never been advertised and is sold only to fleet owners, because if it got into the hands of the public the company fears that people would not understand that it purposely had been toned down for economy's sake and would think the car an inferior product.

The industry hopes to hang out a "welcome back" sign to Hupmobile as well as to Willys. Reopening of Hupp hinges on ability to secure fresh working capital.

After going pell-mell since April 1, car production has tapered and probably will continue to slip gradually downward for the next 60 days. Ford is down to four days a week, but General Motors is still going strong. In fact, Chevrolet has upped its June projected output.

With used car stocks at an all-time peak, the industry is counting on dealers to liquidate their trade-ins in the period from June 1 to October 30. Chevrolet put on a drive in May to reduce used car inventories 15 per cent and is asking dealers to cut them down another 15 per cent this month.



Schrage Photo

Sea-going-Queen—Cunard-White Star's 1,018-ft. challenge to Atlantic passenger supremacy, is built of high-elastic limit steel, fabricated with more than 10,000,000 rivets. Hull and machinery weighs more than 50,000 tons. Each of the 257,000 blades of the turbine were tested and fitted by hand. The four 14-ft. gear wheels weigh nearly 80 tons each, and the gear cases weigh 200 tons. Twenty-seven boilers have 160,000 tubes, and condensers have 60,000 tubes. Each of four propellers weigh 35 tons. Much of the ship is air-conditioned.

BUSINESS ITEMS

Philadelphia Drying Machinery Co., 3351 Stokley St., Philadelphia, has appointed Beeman Combustion Supply Co., 2970 West Grand Blvd., Detroit, its industrial furnace division representative.

Micromatic Hone Corp., DuBois St. and Horton Ave., Detroit, has completed an addition which doubles the plant capacity.

Cumberland Steel Co., Cumberland, Md., has appointed A. C. Cook, 30 Church St., New York, distributor in the New York area.

Falk Mill Supply Co. Inc., machinery and factory equipment merchants, has moved to its new building at 18 Ward St., Rochester, N. Y., Charles Falk, president, announced.

Machinery & Tool Sales, Inc., New Center Bldg., Detroit, has been organized by J. R. Stone, president, and L. J. Jurzek, secretary and treasurer.

Hannifin Mfg. Co., Chicago, has appointed A. C. Cook its representative for the New York City area, including northern New Jersey, Long Island and the Hudson valley. Mr. Cook also represents the Athol Machine & Foundry Co. line of vises.

Chicago Pneumatic Tool Co., New York, has moved from its former location in Pittsburgh to new district offices in the Chamber of Commerce Bldg., there. The company has opened a new sales and service branch at 2415 Commerce St., Dallas, Texas.

MAPI REELECTS

John W. O'Leary, President, and Other Officers are Chosen

At the annual meeting of the Machinery & Allied Products Institute in Cleveland, May 20, President John W. O'Leary was chosen to serve for another year. The other officers, N. W. Pickering, vice-president, Robert E. Friend, treasurer, Paul C. DeWolf, secretary, and Alexander Konkle, assistant secretary, were reelected.

Members elected to the executive committee are:

H. C. Beaver, president, Worthington Pump & Machinery Corp.; Charles E. Brinley, president, American Pulley Co.; P. C. Brooks, vice-president, Fairbanks, Morse & Co.; Phillips Dennett, president, Bird Machine Co.; W. C. Dickerman, president, American Locomotive Co.; M. F. Dunne, president, Pyott Foundry & Machine Co.; Robert M. Gaylord, president, Ingersoll Milling Machine Co.; Frederick V. Geier, president, Cincinnati Milling Machine Co.; Robert W. Gillispie, president, Jeffrey Manufacturing Co.; Leo W. Grothaus, Allis-Chalmers Mfg. Co.; George H. Houston, president, Baldwin Locomotive Works; Philip M. Morgan, treasurer, Morgan Construction Co.; W. S. Shipley, president, York Ice Machinery Corp.; Harold C. Smith, president, Illinois Tool Works, and Guy A. Wainwright, president, Diamond Chain & Mfg. Co.

MILLER ELECTED

J. F. G. Miller, B. F. Sturtevant Co., Boston, was elected president of the Air Conditioning Manufacturers' Association on May 16, at the organization's annual meeting at Hot Springs, Va. J. A. Harlan, Kelvinator Corp., Detroit, is the new vice-president, and P. A. McKittrick, Parks-Cramer Co., Fitchburg, Mass., was elected treasurer.

GREAT LAKES SHOW

Exposition, to Open June 27, Will Show Area's Development

Nearly 200 exhibitors have taken space in the Great Lakes Exposition, Cleveland, which opens June 27 and will continue for 100 days. Practically all of the 200,000 sq.ft. of exposition space has been contracted for, according to Lincoln G. Dickey, manager, Terminal Tower, Cleveland.

The exposition will commemorate the incorporation of Cleveland as a city 100 years ago.

HEADS HUPP

Motor Car Company Elevates Wallace Zweiner to Presidency

WALLACE ZWEINER, formerly treasurer of Hupp Motor Car Corp., Detroit, has been elected president as the first step in opening the company's $8,000,000 manufacturing plant. He will continue to serve as treasurer.

PERSONALS

C. J. DIETRICH, general foreman, Chicago, Burlington & Quincy Railroad, has been promoted to master mechanic of the company's McCook division.

HARRY C. DREIBUSS has been appointed chief mechanical engineer of Scullin Steel Co., St. Louis.

L. S. HUNGERFORD, vice-president, Pullman Co., Chicago, has been put in charge of the company's equipment department, with supervision over construction, maintenance, engineering and purchasing.

ALBERT L. MARSH, president, Hoskins Mfg. Co., Detroit, has been awarded the John Price Wetherill Medal by the Franklin Institute of Pennsylvania, "in consideration of the contribution of a material which has proved of extreme importance to the electrical industries." It is the resistance metal manufactured by his company.

JAMES L. MCINTOSH, Fairfield, Conn., has been elected president of Dictaphone Corp., Bridgeport, succeeding LEON C. STOWELL, who recently resigned to become president of Underwood-Elliot-Fisher Co., Hartford.

CHARLES E. MELKER has been appointed superintendent of motive power, Chicago, Burlington & Quincy Railroad.

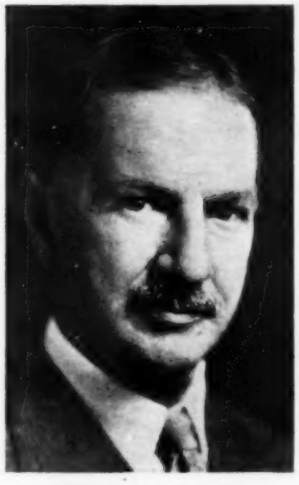
ARTHUR H. PETERS has been appointed manager of manufacturing of the American Ironing Machine Co., Algonquin, Ill.

FRANK B. POWERS has been appointed manager of the railway engineering department, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., succeeding the late CLAUDE BETHEL.

E. R. ROY, assistant general superintendent of motive power, Seaboard Air Lines, has been appointed general superintendent of that department with headquarters at Norfolk, Va.

BURDETT S. WRIGHT has been elected president of Curtiss Aeroplane & Motor Co., Buffalo, N. Y.

Gantt Medalist



MORRIS E. LEEDS

The Henry Laurence Gantt gold medal for distinguished achievement in industrial management as a service to his community will be awarded to MORRIS E. LEEDS, president, Leeds & Northrup Co., Philadelphia, June 4, by the Institute of Management, the research group of the American Management Association, during its meeting in New York.

F. HALL HATELY, formerly with Whitehead Metal Products Co., New York, has been appointed product development engineer of Scovill Mfg. Co., Waterbury, Conn.

G. H. HALPIN HONORED

Machinery Manufacturers Elects St. Paul Man President of Association

G. H. HALPIN, general manager, Minnesota Mining & Mfg. Co., St. Paul, has been elected president of the American Supply and Machinery Manufacturers' Association.

Other officers elected were ROGER TEWKSBURY, Oster Mfg. Co., Cleveland, and W. A. PURTELL, Holo-Krome Screw Corp., Bristol, Conn., first and second vice-presidents, and W. T. GRANT, Dodge Mfg. Co., Mishawaka, Ind., treasurer. R. KENNEDY HANSON, 1108 Clark Bldg., Pittsburgh, is secretary.

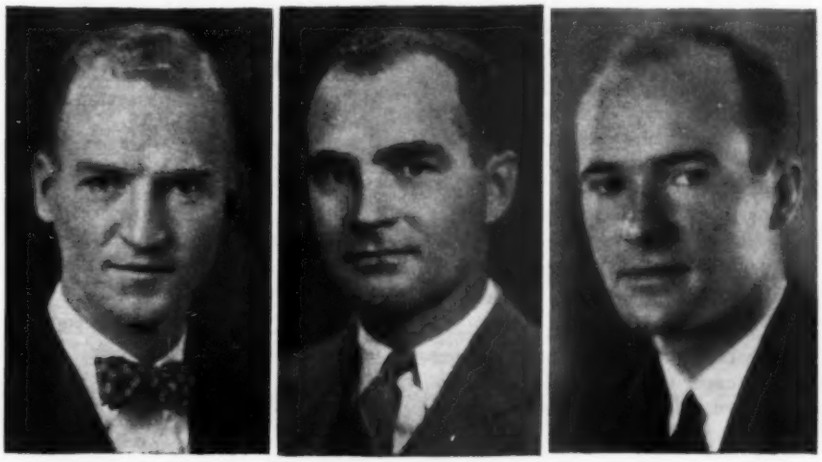
DISTRIBUTORS ELECT

PERCY A. RIDINGS, Syracuse Supply Co., Syracuse, N. Y., was elected president of the National Supply and Machinery Distributors' Association. RUSSEL C. DUNCAN, R. C. Duncan Co., Minneapolis, was chosen first vice-president, and W. T. RYAN, of Cutter, Wood & Sanderson Co., Cambridge, Mass., was elected second vice-president. GEORGE A. FERNLEY, and H. R. RINEHART, Philadelphia, continue as advisory secretary and secretary-treasurer of the Association.

CHOOSE DILLON

C. A. DILLON, Dillon Supply Co., Raleigh, N. C., has been elected president of the Southern Supply and Machinery Distributors' Association.

Grandsons of Founder Promoted by Atkins Saw Works



ELIAS C. ATKINS K. W. ATKINS H. C. ATKINS

ELIAS C. ATKINS, production manager and later superintendent of E. C. Atkins & Co., Indianapolis saw manufacturers, has been elected first vice-president of the company. KEYES W. ATKINS, has been named vice-president in charge of sales, succeeding the late NELSON A. GLADDING, and HENRY C. ATKINS, JR., formerly production manager, has been appointed superintendent. Sons of President ATKINS, they are grandsons of the founder.

Auto Plants Reduce Fluctuations In Jobs

November Announcements Show a Marked Improvement, Companies Report

Automobile manufacturers have reduced the usual sharp seasonal fluctuations in employment by announcing new car models in November instead of January, as heretofore, the Automobile Manufacturers Association found in a survey covering the past six months.

In contrast to the large swings in numbers of workers from month to month in the spring, the maximum variation in employment since last November through April was 20,000, against an average payroll of automotive plants of about 350,000.

Plant efficiency has been increased. During dull weeks in January and February workers were kept busy by producing sub-assemblies, engines, transmissions, axles and other parts, in advance of actual need. Hence the March demand for cars was met without sharp advances in average weekly working hours, as heretofore.

OBITUARIES

ADDISON J. GALLIEN, 71, vice-president and for years production executive of R. Hoe & Co., New York printing press manufacturers, died May 27. He started with the company 49 years ago as a clerk, and designed many types of presses, particularly for newspaper work.

S. A. INGERSOLL, 78, former president of Ingersoll Steel Disc Co., Galesburg, Ill., implement and automotive parts manufacturers, died May 15. Stewart-Warner Corp. purchased the concern in 1928.

WILLIAM J. MADDOX, 80, president, Maddox Machine Co., Jamestown, N. Y., died May 13.

THOMAS NEWELL, 82, formerly general manager of Bartlett Hayward Co., Baltimore munitions and metals manufacturers, died May 26.

SYDNEY A. SMITH, manager of the gear department, Meisel Press Mfg. Co., Boston, died May 25.

FREDERICK ROLLIN WHITE, chairman and former president of Baker-Raulang Co., Cleveland, and active in many manufacturing enterprises, died May 13.

Tool Manufacturer Dies

GEORGE H. FELTES, 66, president, Standard Electrical Tool Co., Cincinnati, died May 6. In 1903 he was one of the organizers of the United States Electric Tool Co., and retired in 1925. In 1926 he acquired control of the Standard company.

MEETINGS

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Summer Meeting, June 15-20, Dallas, Texas. C. E. Davies, Secretary, 29 West 39th St., New York.

AMERICAN SOCIETY FOR METALS. Meeting, May 1–2. State College, Pa.

AMERICAN SOCIETY FOR TESTING MATERIALS. 39th Annual Meeting, June 29–July 3, Atlantic City, N. J. C. L. Warwick, Secretary-Treasurer, 260 South Broad St., Philadelphia.

DAIRY & ICE CREAM MACHINERY MANUFACTURERS ASSOCIATION. Oct. 12–17, Atlantic City, N. J. Roberts Everett, vice-president, 232 Madison Ave., New York.

GREAT LAKES EXPOSITION, July, August and September, Cleveland. Lincoln G. Dickey, manager, Terminal Tower, Cleveland.

NATIONAL METAL SHOW. 18th Annual Exposition. Oct. 19–23, Lakeside Exposition Hall, Cleveland. W. H. Eisman, secretary, 7016 Euclid Ave., Cleveland.

NATIONAL SAFETY COUNCIL, INC. 25th Congress and Exposition, Oct. 5–9, Atlantic City, N. J.

SOCIETY OF AUTOMOTIVE ENGINEERS, INC., Aircraft Production Meeting, October, Los Angeles, Calif. John A. C. Warner, secretary and general manager, 29 West 39th St., New York.

EXPORT OPPORTUNITIES

Fruit-packing machinery and equipment. (Agency.) Buenos Aires, Argentina. *643.

Hair-brush manufacturing machinery; bristle mixers, cutters, sizers, nailers, drillers and wood polishing equipment. (Purchase.) Klatovy, Czechoslovakia. *645.

Lime making, hydrating, ammonia recovering equipment and machinery. (Purchase.) Tokuyama, Japan. *667.

Pineapple and juice preparing and canning machinery. (Purchase.) Singapore, S.S. *664.

Plastic moulding machinery. (Purchase.) Santiago, Chile. *644.

Salt, recovery from sea water, machinery. (Purchase.) Calcutta, India. *641.

Spinning machinery, accessories and parts. (Purchase.) Cairo, Egypt. *706.

Tin can manufacturing machinery, embossers for cans. (Purchase.) Colombo, Ceylon. *695.

Fruit preservation installations, air-conditioning equipment. (Agency.) Brussels, Belgium. *693.

Sugar refinery, brewery, paper mill, textile and chemical manufacturing machinery and specialties. (Agency.) Paris, France. *737.

Beer-can filling equipment. (Purchase.) Habana, Cuba. *803.

Concrete and bitumen road-making machinery, portable air compressors, gas and diesel. (Agency.) Montreal, Que., Canada *813.

Grape juice manufacturing machinery. (Purchase.) Chefoo, China. *822.

Surgical and hypodermic needle manufacturing machines. (Purchase.) Mazamet, France. *812.

Confectionery, chocolate and biscuit making machinery and equipment. (Agency.) Brussels, Belgium. *868.

Paper and paperboard making, stitching, cutting, labeling machinery. (Agency.) Zwelle, Netherlands. *869.

Stearin and glycerine manufacturing equipment. (Purchase.) Mexico City, Mexico. *846.

Machine Tools. (Agency.) London, England. *602.

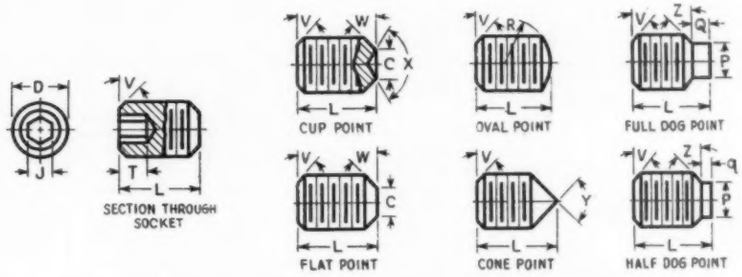
Electric Tools. (Purchase.) Zagreb, Yugoslavia. *558.

*Interested American firms and individuals may obtain the names and addresses of the foreign firms making these inquiries upon application to the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, Washington or any district or cooperative office. Please refer to key number.

American Machinist — REFERENCE BOOK SHEET ©

American Standard Socket Setscrews

Sponsored by the Society of Automotive Engineers and the American Society of Mechanical Engineers.
Reproduced from ASA standard B18.3-1936 through courtesy of the American Standards Association



Dimensions of Hexagonal Socket Set Screws

D	C			R	Y		P		Q	q	J	
Nominal Diameter	Cup and Flat[3] Point Dia.			Oval Point Radius	Cone Point Angle[3]		Full Dog Point and Half Dog Point,[1, 2, 3]				Socket Width[4] Across Flats	
					118°±2° for these Lengths and Under	90°±2° for these Lengths and Over	Diameter		Full	Half		
	Mean	Max	Min				Max	Min			Max	Min
5	1/16	0.067	0.057	3/32	1/8	3/16	0.083	0.078	0.06	0.03	0.0635	1/16
6	.069	0.074	0.064	7/64	7/64	3/16	0.092	0.087	0.07	0.03	0.0635	1/16
8	5/64	0.087	0.076	1/8	3/16	1/4	0.109	0.103	0.08	0.04	0.0791	5/64
10	3/32	0.102	0.088	9/64	3/16	1/4	0.127	0.120	0.09	0.04	0.0947	3/32
12	7/64	0.115	0.101	5/32	3/16	1/4	0.144	0.137	0.11	0.06	0.0947	3/32
1/4	1/8	0.132	0.118	3/16	1/4	5/16	5/32	0.149	1/8	1/16	0.1270	1/8
5/16	11/64	0.172	0.156	15/64	5/16	3/8	13/64	0.195	5/32	5/64	0.1582	5/32
3/8	13/64	0.212	0.194	9/32	3/8	7/16	1/4	0.241	3/16	3/32	0.1895	3/16
7/16	15/64	0.252	0.232	21/64	7/16	1/2	19/64	0.287	7/32	7/64	0.2207	7/32
1/2	9/32	0.291	0.270	3/8	1/2	9/16	11/32	0.334	1/4	1/8	0.2520	1/4
9/16	5/16	0.332	0.309	27/64	9/16	5/8	25/64	0.379	9/32	9/64	0.2520	1/4
5/8	23/64	0.371	0.347	15/32	5/8	3/4	15/32	0.456	5/16	5/32	0.3155	5/16
3/4	7/16	0.450	0.425	9/16	3/4	7/8	9/16	0.549	3/8	3/16	0.3780	3/8
7/8	33/64	0.530	0.502	21/32	7/8	1	21/32	0.642	7/16	7/32	0.5030	1/2
1	19/32	0.609	0.579	3/4	1	1 1/8	3/4	0.734	1/2	1/4	0.5655	9/16
1 1/8	43/64	0.689	0.655	27/32	1 1/8	1 1/4	27/32	0.826	9/16	9/32	0.5655	9/16
1 1/4	3/4	0.767	0.733	15/16	1 1/4	1 1/2	15/16	0.920	5/8	5/16	0.6290	5/8
1 3/8	53/64	0.848	0.808	1 1/32	1 3/8	1 5/8	1 1/32	1.011	11/16	11/32	0.6290	5/8
1 1/2	29/32	0.926	0.886	1 1/8	1 1/2	1 3/4	1 1/8	1.105	3/4	3/8	0.7540	3/4
1 3/4	1 1/16	1.086	1.039	1 5/16	1 3/4	2	1 5/16	1.289	7/8	7/16	1.0040	1
2	1 7/32	1.244	1.193	1 1/2	2	2 1/4	1 1/2	1.474	1	1/2	1.0040	1

All dimensions in inches.

[1]Where usable length of thread is less than nominal diameter, half dog point shall be used.

[2]Allowable eccentricity of dog point axis with respect to axis of screw shall not exceed 3 per cent of nominal diameter of screw with a minimum of 0.005 in.

[3]CHAMFERS AND POINT ANGLES. $W = 45° + 5°, - 0°$; $X = 118° \pm 5°$; $Y =$ (see Table); $Z = 35° + 5°, - 0°$.

[4]SOCKET DEPTH (T). The depth of the socket shall be as great as practicable but varying conditions render it inadvisible to specify definite values.

[5]SOCKET END CHAMFER (V). Socket end of screw shall be flat and chamfered. The flat shall be normal to the axis of the screw and the chamfer (V) shall be at an angle of $35° + 5°, - 0°$ with the surface of the flat. The chamfer shall extend to the bottom of the thread and the edge between flat and chamfer shall be slightly rounded.

[6]LENGTH (L). The length of the screw shall be measured overall on a line parallel to the axis. The difference between consecutive lengths shall be as follows:

(a) for screw lengths 3/4 to 1 in. difference = 1/8 in.

(b) for screw lengths 1 to 1 in. difference = 1/4 in.

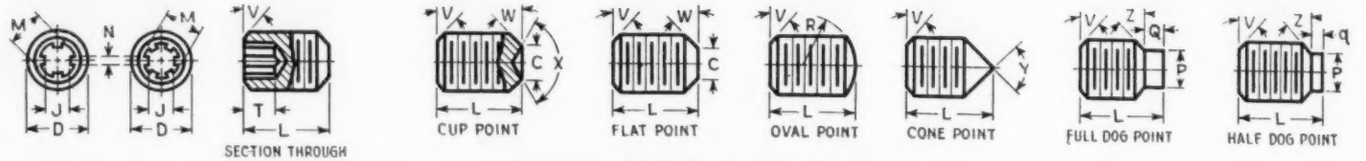
(c) for screw lengths 1 to 4 in. difference = 1/4 in.

(d) for screw lengths 4 to 6 in. difference = 1/2 in.

[7]LENGTH TOLERANCE. Allowable tolerance on length (L) shall be 3 per cent on lengths 2 in. and under with a minimum of 0.020 in., one-half to be applied plus and one-half minus; on lengths over 2 in. to 6 in. plus or minus 1/32 in.; on lengths over 6 in. plus or minus 1/16 in.

[8]SCREW THREADS shall conform to the American Standard for Screw Threads. (B1.1-1935)

American Standard Socket Setscrews



Dimensions of Fluted Socket Set Screws

D	C			R	Y		P		Q	q	Number of Flutes	J		M		N	
Nominal Diameter	Cup and Flat[3] Point Dia.			Oval Point Radius	Cone Point Angle[3]		Full Dog Point and Half Dog Point,[1, 2, 3]					Socket Dia.[4] Minor		Socket Dia.[4] Major		Socket Land Width	
					118°±2° for these Lengths and Under	90°±2° for these Lengths and Over	Diameter		Full	Half							
	Mean	Max	Min				Max	Min				Max	Min	Max	Min	Max	Min
5	1/16	0.067	0.057	3/32	1/8	3/16	0.083	0.078	0.06	0.03	4	0.053	0.052	0.071	0.070	0.022	0.021
6	.069	0.074	0.064	7/64	1/8	3/16	0.092	0.087	0.07	0.03	4	0.056	0.055	0.079	0.078	0.025	0.024
8	5/64	0.087	0.076	1/8	3/16	1/4	0.109	0.103	0.08	0.04	6	0.079	0.078	0.098	0.097	0.022	0.021
10	3/32	0.102	0.088	9/64	3/16	1/4	0.127	0.120	0.09	0.04	6	0.097	0.095	0.113	0.111	0.027	0.025
12	7/64	0.115	0.101	5/32	3/16	1/4	0.144	0.137	0.11	0.06	6	0.097	0.095	0.113	0.111	0.027	0.025
1/4	1/8	0.132	0.118	3/16	1/4	5/16	5/32	0.149	1/8	1/16	6	0.127	0.125	0.147	0.145	0.032	0.030
5/16	11/64	0.172	0.156	15/64	5/16	3/8	13/64	0.195	5/32	5/64	6	0.160	0.158	0.185	0.183	0.041	0.040
3/8	13/64	0.212	0.194	9/32	3/8	7/16	1/4	0.241	3/16	3/32	6	0.190	0.188	0.219	0.217	0.052	0.050
7/16	15/64	0.252	0.232	21/64	7/16	1/2	19/64	0.287	7/32	7/64	6	0.221	0.219	0.256	0.254	0.062	0.060
1/2	9/32	0.291	0.270	3/8	1/2	9/16	11/32	0.334	1/4	1/8	6	0.254	0.252	0.297	0.295	0.072	0.070
9/16	5/16	0.332	0.309	27/64	9/16	5/8	25/64	0.379	9/32	9/64	6	0.254	0.252	0.297	0.295	0.072	0.070
5/8	23/64	0.371	0.347	15/32	5/8	3/4	15/32	0.456	5/16	5/32	6	0.315	0.312	0.380	0.377	0.092	0.089
3/4	7/16	0.450	0.425	9/16	3/4	7/8	9/16	0.549	3/8	3/16	6	0.386	0.383	0.463	0.460	0.112	0.109
7/8	33/64	0.530	0.502	21/32	7/8	1	21/32	0.642	7/16	7/32	6	0.506	0.503	0.600	0.597	0.142	0.139
1	19/32	0.609	0.579	3/4	1	1 1/8	3/4	0.734	1/2	1/4	6	0.568	0.564	0.654	0.650	0.157	0.153
1 1/8	43/64	0.689	0.655	27/32	1 1/8	1 1/4	27/32	0.826	9/16	9/32	6	0.568	0.564	0.654	0.650	0.157	0.153
1 1/4	3/4	0.767	0.733	15/16	1 1/4	1 1/2	15/16	0.920	5/8	5/16	6	0.631	0.627	0.790	0.786	0.184	0.180
1 3/8	53/64	0.848	0.808	1 1/32	1 3/8	1 5/8	1 1/32	1.011	11/16	11/32	6	0.631	0.627	0.790	0.786	0.184	0.180
1 1/2	29/32	0.926	0.886	1 1/8	1 1/2	1 3/4	1 1/8	1.105	3/4	3/8	6	0.756	0.752	0.958	0.954	0.221	0.217
1-3/4	1 1/16	1.086	1.039	1 5/16	1 3/4	2	1 5/16	1.289	7/8	7/16	6	1.007	1.003	1.275	1.271	0.298	0.294
2	1 7/32	1.244	1.193	1 1/2	2	2 1/4	1 1/2	1.474	1	1/2	6	1.007	1.003	1.275	1.271	0.298	0.294

All dimensions in inches.

[1]Where usable length of thread is less than nominal diameter, half dog point shall be used.

[2]Allowable eccentricity of dog point axis with respect to axis of screw shall not exceed 3 per cent of nominal diameter of screw with a minimum of 0.005 inch.

[3]Chamfers and Point Angles. $W = 45° + 5°, — 0°$; $X = 118° \pm 5°$; $Y =$ (see Table); $Z = 35° + 5°, — 0°$.

[4]Socket Depth (T). The depth of the socket shall be as great as practicable but varying conditions render it inadvisable to specify definite values.

[5]Socket End Chamfer (V). Socket end of screw shall be flat and chamfered. The flat shall be normal to the screw and the chamfer (V) shall be at an angle of $35° + 5° — 0°$ with the surface of the flat. The chamfer shall extend to the bottom of the thread and the edge between flat and chamfer shall be slightly rounded.

[6]Length (L). The length of the screw shall be measured overall on a line parallel to the axis. The difference between consecutive lengths shall be as follows:

(a) for screw lengths 1/4 to 1 in., difference = 1/16 in.

(b) for screw lengths 1 to 1 in., difference = 1/8 in.

(c) for screw lengths 1 to 4 in., difference = 1/4 in.

(d) for screw lengths 4 to 6 in., difference = 1/2 in.

[7]Length Tolerance. Allowable tolerance on length (L) shall be 3 per cent on lengths 2 in. and under, with a minimum of 0.020, one-half to be applied plus and one-half minus. On lengths over 2 in. to 6 in. plus or minus 1/32 in. On lengths over 6 in. plus or minus 1/16 in.

[8]Screw Threads shall conform to the American Standard for Screw Threads. (B1.1-1935)

IF THE WORKER ONLY KNEW—

Wouldn't he be strong for Employee Representation?

The series to date: 30-hour Week; Townsend Plan; Labor Relations Law; Taxes; Mechanization; Employee Representation. Each available in 3x5 pamphlet form for management to distribute to workers

"GOING TO VOTE for the Employee Representation plan, Bill?"

With both their planers settled down on long cuts, Sam has ambled over to Big Bill's machine, from which he can keep an eye on his own.

"Sure am, Sam, and I don't mind telling you I'd like to be a representative."

"Well, you know you're sure of my vote, whenever election is held. But first we have to vote about accepting the plan, don't we?"

"That's right."

"How'd the thing start, Bill? Did the front office tell us to take it up?"

"Wait a minute, Sam. Let's get this straight. The front office didn't *tell* us to do it—and didn't *ask* us to do it—and didn't give us any plan. Wish they *had* helped us work it up, but they wouldn't. Afraid they'd be accused of coercion, or undue influence, I suppose. Far as I can see, it's the plan that counts, not who put it down on paper. We had some job getting things straight."

"Who's we?"

"Well, I'm part of we. Frank Wright of the lathe department is part, so is Jim Burroughs of milling, Tom Smith of drilling, John Roach of assembly. There are two or three others."

"And you fellows worked the whole thing out without any help?"

"Of course not, Bill. We got hold of the plans of 15 or 20 other companies. And we've been reading a lot about it in industry publications. I had clippings of articles that gave actual plans."

"As I understand it, we employees are going to elect representatives to sit down with representatives of the management and discuss our problems. That right? Talk about safety, I suppose, and working conditions—and that's about all."

"Oh, no. We'll talk about those things, but we'll also talk hours and wages, which are what we're most interested in."

"And what will the management people talk about, Bill?"

"Same things. And I hope they'll talk about a lot more—orders, costs, profits, for example."

"You think they will? Think we'll really find out who gets all the gravy around here?"

"I see you still have the impression that somebody is getting an awful lot of money out of this place. Yes, I think you'll really find out now why planer hands can't get as much as presidents—or even foremen."

"Well, suppose we do get all the dope—and we still want more money, or shorter hours, and the bosses say 'No,' what can we do then? If we don't belong to a union we can't strike, because there won't be any benefits and we can't hold out."

"The way our plan is written, Sam, things don't end up in disagreement. Differences are taken up and up, until they can finally be referred to outside disinterested arbitrators. That's the way a lot of the good plans work."

"But Bill, why should we go to all that trouble? Why not join a union to start with and have everything looked after for us?"

"That's easy, Sam. You wouldn't *know* any more then than you know now. You'd be *told* a lot of things. You'd be *told* you had more coming to you. You'd be *told* to go on strike to get it. But you wouldn't be taking action on your own judgment, and you might be told to do the very thing that would hurt you worst."

"But won't my representatives be telling me what to do if we have employee representation?"

"Yes, to some extent. But they'll be men you know well. And as an individual you can take even a personal grievance to your employer. And the representatives don't set your wages, and make them the same as everybody else's. And you don't pay any dues to support organizers who all too frequently get workers no place except into hot water."

"You see plenty of advantages then, Bill?"

"You bet I do, Sam, and I'm going to work for the adoption of the plan."

Ideas FROM PRACTICAL MEN

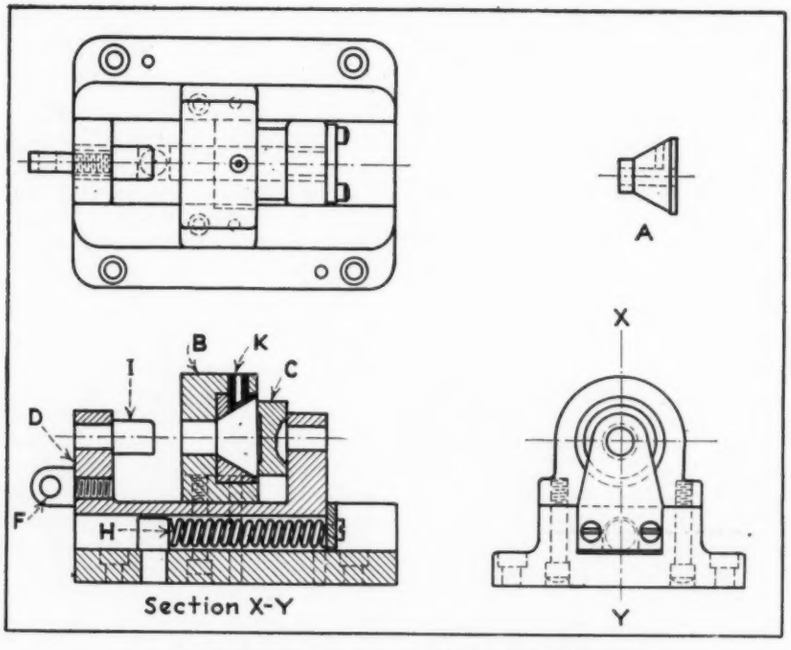
Treadle-Operated Jig

J. R. WHITTLES

In the illustration is shown a quick-acting jig in which the work is clamped by downward pressure on a treadle and is unclamped and ejected when pressure on the treadle is released.

The work *A* is located in a nest in the upright *B* and is clamped by the block *C*, which is attached to the sliding carriage *D*. The carriage slides in a slot in the jig base and is operated by a treadle (not shown), connection to which is made by a cable passing over a pulley and attached to the eyebolt *F* in the end of the carriage. Pressure on the treadle moves the carriage to the left and brings block *C* into contact with the work and clamps it.

When pressure on the treadle is released, the spring *H* moves the carriage to the right and unclamps the work. As the carriage moves to the right, the pin *I* contacts the work and ejects it from its nest. The upright *B* carries the guide bushing *K* for the drill and straddles the carriage, permitting it to slide without interference. The jig is clamped to the drill press table to prevent it from shifting when pressure is put upon the treadle.



The work is located in a nest and is clamped when pressing a treadle downward. When pressure on the treadle is released, the work is unclamped and is automatically ejected

Double Chamfer Set-Up

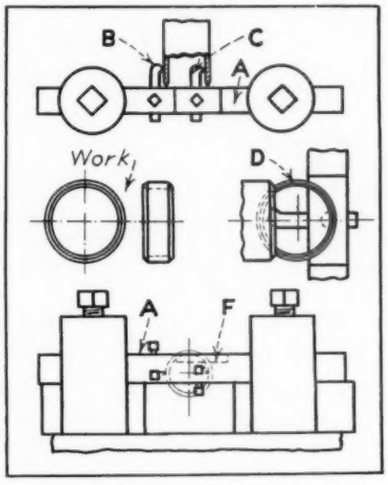
H. MOORE
Hamilton, Ontario, Canada

One of the parts of an automatic flusher is a short sleeve made from brass tubing and chamfered at both ends, inside and out, the work being done in a turret lathe. To produce the double chamfer and cut off the work with one tool set-up, the arrangement shown in the illustration is used.

The toolbar *A* is held in both the front and the rear toolholders and carries the tools *B* and *C*, tool *B* cutting the chamfer on the outside while tool *C* cuts the chamfer on the inside. Both chamfers are cut at the same time, tool *C* being used upside down.

After the end of the tube has been chamfered, the tube is fed forward against the toolbar as a stop and the chamfers at the rear end of the sleeve are cut with the tools in the position shown. When the tools have been fed in far enough to form the chamfers, the sleeve is severed from the tube.

Since this last cut leaves the end of the tube chamfered, it is necessary only to feed the tube against the tool bar and repeat the operation. After the sleeve has been cut off, the cross-slide is drawn back until tool *C* is approximately in the center of the tube and the sleeve is then turned as shown at *D* and is lifted over the tool, the toolbar being cut away at *F* for clearance.



Sleeves cut from a brass tube are chamfered at both ends, inside and out and cut off, all with one tool set-up and one motion of the cross-slide

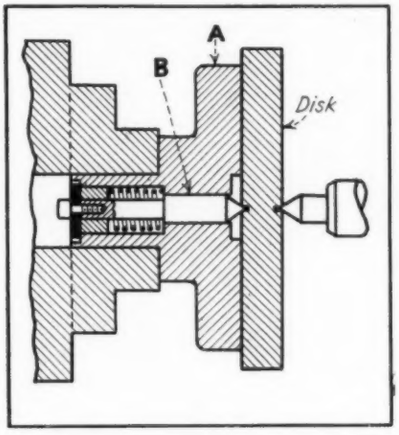
Gage for Setting Underwidth Cutters

ROLAND V. HUTCHINSON

The device described by Frank Moore in an article under the title given above (*AM*—Vol. 80, page 170), theoretically meets conditions for centering or locating cutters over either cylindrical or conical shafts. But to

set the cutter accurately it is essential that it be free from sidewise wobble and that the contacting straight-edge be always parallel with the bisector of the included angle of the Vee in the base.

The first condition rarely occurs in the average small shop, while fulfillment of the second requires real design and execution. It is my opinion that more conventional methods of setting the cutter with square and scale, locating from the "high" side of the cutter and fitting the key on the second cut, will yield better results at less expense that would procurement and use of the device described.



The tailstock center, which is of the "live" type, forces the disk against the face of the holder tightly enough to prevent it from slipping under pressure of the cut

Holder for Turning and Facing a Disk

WILLIAM M. HALLIDAY
Baildon, Yorkshire, England

The device shown above is for holding a disk for turning and facing. The cast-iron body *A* has a shank for holding it in the lathe chuck and is bored and counterbored for the spring-actuated center *B*. The disk to be machined is centered from each side so that the center holes are in accurate alignment.

In use, a disk is placed so that the spring-actuated center engages the center hole in the back and the tailstock center, which is of the "live" type, is brought up against the disk, forcing the spring-actuated center inward and holding the disk against the face of the fixture tightly enough to prevent it from slipping under pressure of the cut. After the disk has been turned to the required diameter and faced on the exposed side, it is reversed for facing the opposite side.

Solid Crosshead Pin Bushings

FRANK C. HUDSON

Solid end connecting rods have grown into almost universal favor on railways during the past few years. Beginning with side rods they have now been largely adopted for the back end of the main rods as well.

I recently heard of two locomotives with solid, or floating, bushings in the front end of the main rod, in the crosshead bearing. Further inquiry developed the fact that this experiment was tried on two small passenger locomotives on one division of a southern railway. They were finally discontinued because of high maintenance.

Jig for Drilling Crossholes

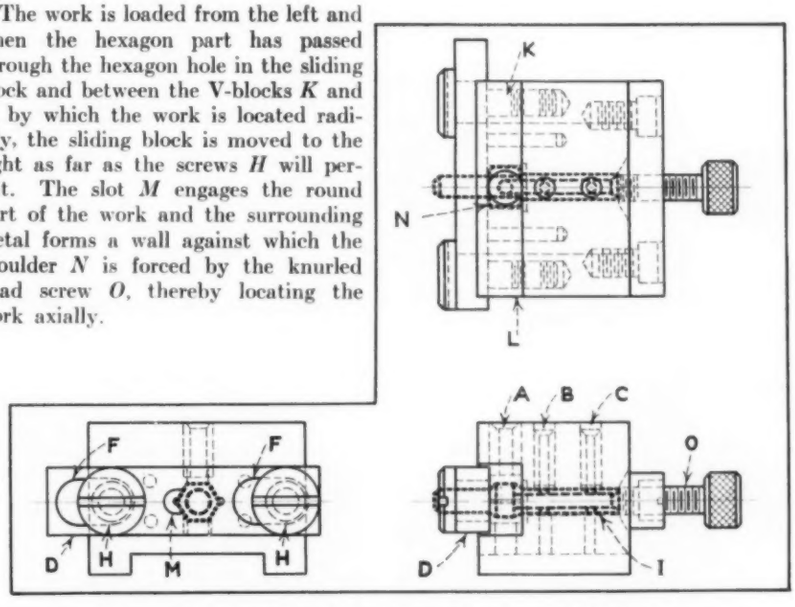
F. SERVER

In the illustration is shown a jig for holding a small sleeve while three crossholes are being drilled.

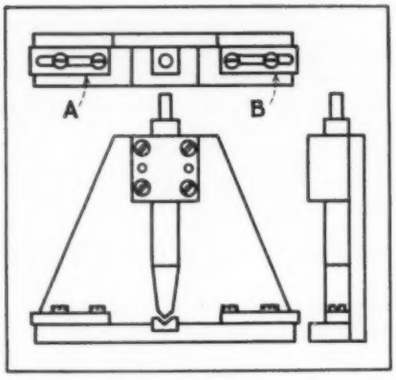
The work, indicated by heavy dotted lines, is a small sleeve made from hexagon stock in a screw machine. Both ends are turned, leaving a hexagon portion nearest one end, the long end having a blind hole reaching to the hexagon portion. Bushings *A*, *B* and *C* are provided for guiding the drill.

In loading the jig, the sliding block *D* is moved to the left until the ends of the slots *F* are in contact with the bodies of the screws *H*, bringing the hexagon hole in the sliding block in line with the hole *I* in the body of the jig.

The work is loaded from the left and when the hexagon part has passed through the hexagon hole in the sliding block and between the V-blocks *K* and *L*, by which the work is located radially, the sliding block is moved to the right as far as the screws *H* will permit. The slot *M* engages the round part of the work and the surrounding metal forms a wall against which the shoulder *N* is forced by the knurled head screw *O*, thereby locating the work axially.



The work is located radially by engaging opposed V-blocks and axially by a shoulder on the hexagon part being held in contact with a block by a knurled head screw



A tool of this kind provided with suitable punches and dies can be used for small lots needing light punching, bending, staking or swaging

Improvised Utility Tool

IRA S. WILLIAMS

The tool illustrated was designed to do light punching, bending, swaging and staking on small-quantity orders where hand work would be too costly. It is intended for use under the counterweighted spindle of a sensitive drill press, utilizing the vertical movement of the spindle.

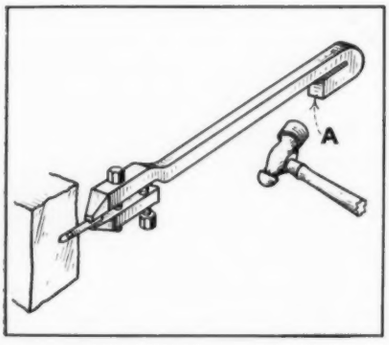
While the punch and the die shown in the tool are for making small right-angle bends, they can be replaced by punches and dies suitable for the work in hand. The adjustable gages at *A* and *B* can be made to meet the requirements of individual cases.

Tool for Pulling Pins From Blind Holes

CHARLES H. WILLEY

The pin puller illustrated is well worth the making by any mechanic who has to remove pins from blind holes, even occasionally. It is also very useful to diemakers in removing dowel pins. The parallel jaws are operated by the clamp screws in the same manner as are the jaws of toolmakers' clamps, and when tightened on a pin will hold it in a viselike grip.

After the jaws have been tightened on the pin, a few blows of a hammer on the folded-over end *A* will do the work.



After the jaws have been tightened on the pin, a few blows by a hammer on the end A will do the work

Combination Triangles

PHIL. E. VERAA

In the illustration are shown combination triangles that I have been using for some time and have found to be so efficient that I thought they would be of interest to the readers of *American Machinist*.

As shown in Fig. 1, a 30-deg. triangle has a small part of its angular edge cut to an angle of 38 deg. for laying out countersunk holes for flat-head screws. The 38-deg. angle should be long enough to allow for extending the lines for dimensioning the screw head. Every draftsman knows that much time is required to lay out such holes by the use of a protractor.

Although the included angles for the heads of flat-head screws vary from 70 to 82 deg., every shop has its standard. The common practice is to lay out the holes with a 45-deg. triangle. In Fig. 2 is shown a layout for a $\frac{5}{8}$-in. screw drawn with a 45-deg. triangle. It will be noted that the screw head does not project below the under side of plate *A*. In Fig. 3, the screw hole is laid out correctly (76 deg. is standard in our shop). The screw head projects below the under side of plate *A* and the draftsman can readily see that the tapped hole in part *B* should be slightly countersunk so as not to interfere with the screw head.

In Fig. 4 is shown a triangle combining 30 and 45 deg. Note, in Fig. 5, how different combinations of angles can be drawn with such a triangle by simply flipping it from one side to the other.

Celluloid triangles are easily cut. After a line of the desired angle has been scribed, the part not wanted can be cut off with a sharp knife. The cut edge can be finished by rubbing it over sandpaper tacked to a board and then polishing it on a stone.

Marking Sizes on Drills

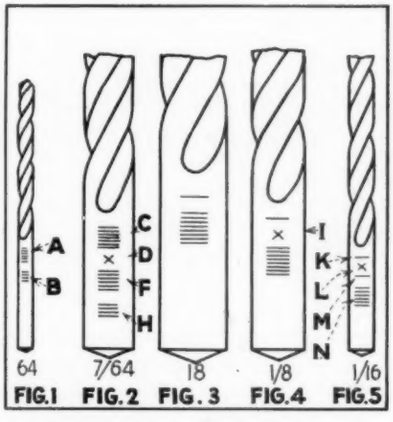
THOMAS TRAIL

Sometimes the sizes marked on the shanks of straight-shank drills are worn off by slippage in the chuck. When that occurs it is impossible to tell the sizes of the drills without gaging them. Also, the sizes marked on the shanks of very small drills are difficult to distinguish.

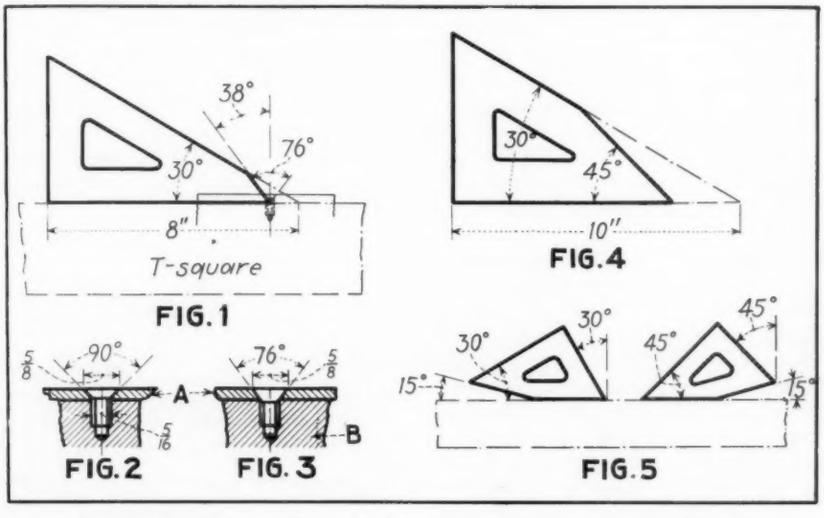
The suggested method of marking drills, as indicated in the illustration, overcomes the difficulty to a great extent. It consists in filing a certain number of notches in the soft parts of the shanks.

In Fig. 1 is shown a No. 64 drill in which six notches are filed at *A*, then a space is left and four more notches are filed at *B*. In Fig. 2 is shown a $\frac{7}{64}$-in. drill. Seven notches are filed at *C*, indicating the numeral seven. Then a cross is filed at *D* to indicate that the drill is of fractional size. Next are filed six notches at *F*, then a space is left and at *H* four more notches are filed.

The No. 18 drill in Fig. 3 has markings of a type similar to those on the drill in Fig. 1. In Fig. 4 the markings on a $\frac{1}{8}$-in. drill are shown, the cross at *I* indicating that the drill is of fractional size. A $\frac{1}{16}$-in. drill is shown in Fig. 5. One notch is filed at *K* to indicate the numeral one of the numerator. Here again the cross at *L* denotes a fractional size. The notch at *M* indicates the numeral one of the denominator, and is followed by a space. Then six more notches are filed at *N*, completing the denominator.



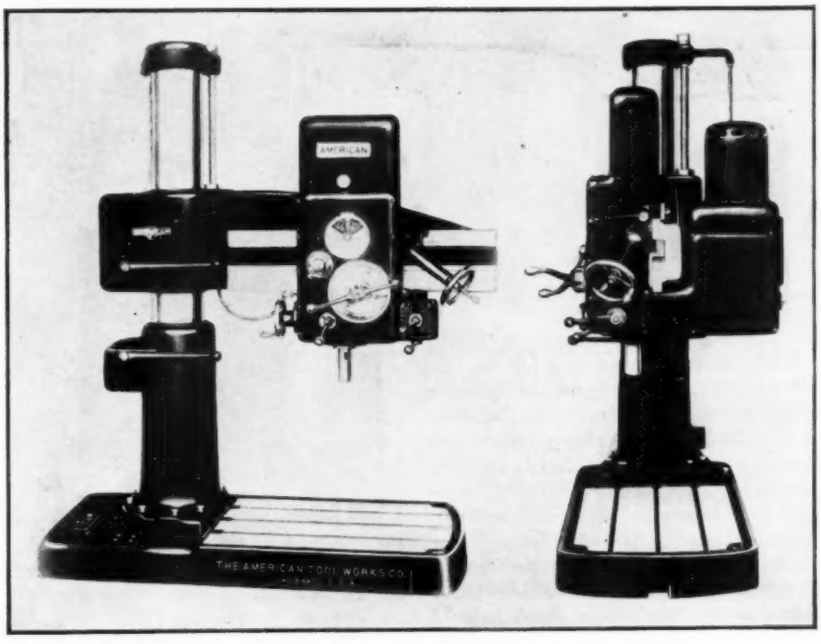
When sizes on the shanks of straight-shank drills are worn off by slippage in the chuck, permanent marks can be made by a few strokes of a file



Parts of the angular edges of triangles cut so as to form combination angles are very useful to the draftsman for laying out many things

Shop Equipment NEWS

American "Hole Wizard" Radial Drills With 9 and 12 Speeds



"Hole Wizards" in 9- and 12-speed models are now available from the American Tool Works Company, Cincinnati. Both radials have a 9-in. column. The 9-speed model is made with 3 or 4 ft. arms, has a 3-hp. motor, and the following capacities—1¼ in. in cast iron, ¾ in. in steel, and a ¾ in. tap in steel. Only one arm size is available for the 12-speed machine, 3 ft. Power is supplied by a 5-hp. motor. Capacity is, drilling in cast iron 2 in., in steel 1½ in., and tapping in steel 1½ in.

In the 9-speed machine the standard speed range is from 70 to 1,500 r.p.m. By the use of pick-off gears this range may be changed to suit a variety of requirements. For example, either a range of 100 to 2,150 r.p.m., or 140 to 3,000 r.p.m. can be provided. Somewhat similar ranges are available for the 12-speed machine. They are 50 to 1,500 r.p.m., 70 to 2,100 r.p.m. or 100 to 3,000 r.p.m.

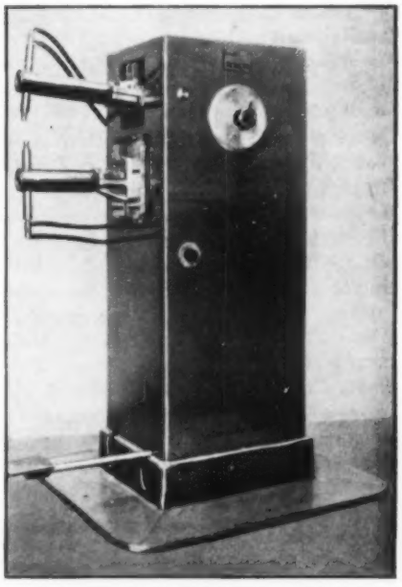
Both of these machines are built along similar lines. The spindle reverse for tapping is accomplished by means of an almost instantaneously reversing motor. The head, which is 100 per cent anti-friction mounted and automatically oiled, is mounted on two large roller bearings which roll on a hardened steel guideway located at the lower portion of the square arm. This construction provides a narrow guideway for the head mounting. All speed-changing mechanism is located within the head casting as is also the spindle speed unit. Nitralloy steel is employed for the spindle which is ground for its entire length. The spindle sleeve is also made of hardened Nitralloy and honed to size. This sleeve is mounted in precision Timken roller bearings, and provided with means for adjustment to compensate for wear.

Drive to the spindle is through hardened and ground helical gears. In the 9-speed machine there are four rates of geared power feed from 0.004-0.020 in., while in the 12-speed model there are six power feeds, including 0.004-0.025 in. All power feeds are produced by a sliding gear unit. The connection between the feeding unit and the spindle is through a band type friction adjustable from the outside. An automatic feed trip will operate up to 10 in. at one setting on the 9-speed machine, and up to 12 in. on the 12-speed machine.

Power elevating and lowering for the arm are provided as standard equipment. The motor and reversing drum are built into a compact unit at the rear of the arm girdle and connected to the revolving elevating nut which operates on a stationary elevating screw. An angular clutch at the top of the stationary elevating screw disengages automatically and stops the function of the elevating mechanism if the arm, the tool or the head is accidentally caused to strike the work while being lowered.

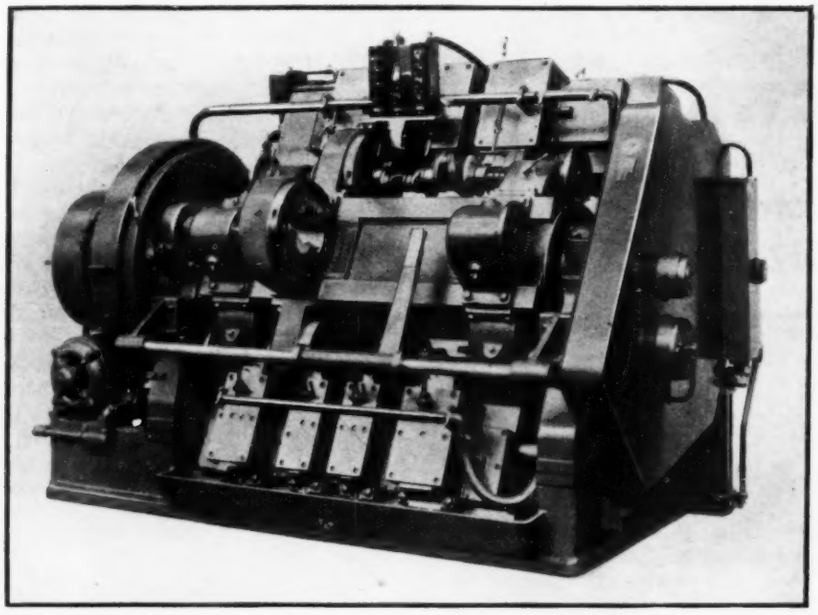
Eisler Fabricated Box-Type Welders

Fabricated box type welders have been introduced by Eisler Engineering Co., 770 South 13th St., Newark, N. J., in sizes from 35 to 250 kva. They are intended for handling various classes of sheet-metal work of varying thickness, either intermittently or on a production basis. They may be had foot-operated or motor driven with speed changes ranging from 30 to 100 welds per min., or air operated. Throat depths from 12 to 36 in. can be had.



Eisler fabricated box type welder in 35 to 250 kva. sizes

Le Blond DM Automatic Four-Station Crankshaft Lathe



A high-production crankshaft finish turning lathe for all line, stub and flange end bearings, and facing all the related portions thereto, has been announced by R. K. Le Blond Machine Tool Co., Cincinnati, Ohio. Use of the machine eliminates a straightening and a rough-grinding operation. Four stations on a revolving drum advance the crankshaft progressively from the loading and unloading station through the three machining operations, each removing a relatively small amount of stock, thus setting up a minimum of strain on the cutting tools. A distinct saving in time and spoilage, and a more accurate shaft are produced.

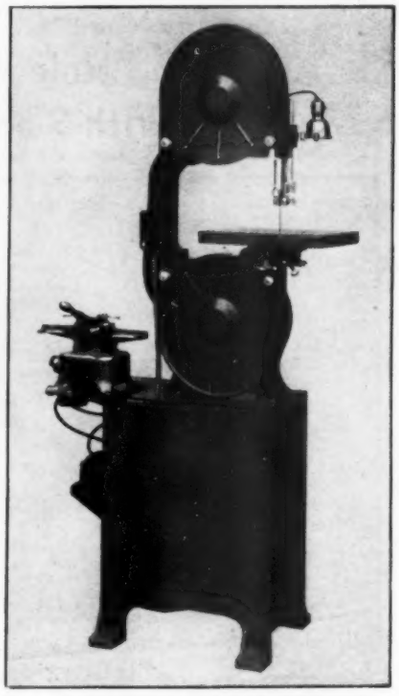
A finished shaft is produced with each movement of the drum. The shaft is placed between centers through a center driving chuck which positively locates and clamps the shaft on milled spots after it has been located endwise to a swinging gage conveniently located on the front of the machine. The driving chucks are operated by a two-speed motor, so that the rotating speed of the shaft can be reduced as the tools near the end of the cutting cycle. This control of the speed, together with the rubber-cushioned chucks, produces a high degree of finish, free of chatter and vibration marks. As each driving chuck comes to the loading station it is automatically stopped and braked from further rotation. A supplementary manual control is provided so the operator can rotate the driving chuck at will when it is in the loading position.

A rotating drum carries the driving chucks and work spindles for locating the crankshaft. A hydraulic indexing mechanism is used to rotate the drum with a suitable indexing plunger, synchronized to lock it in position. Chucks are encircled by a band or yoke, which rigidly supports and hydraulically clamps them in the machining operations, thus preventing any twisting or weaving of the drum from the action of the cutting tools on the crankshaft. A wiring device is interlocked with the electrical system to prevent indexing until the work has been properly chucked and the operator has manipulated suitable controls to continue the machine on its working cycle. Production averages between 45 and 55 per hour.

Grob S14 Metal Bandsaw

A metal bandsaw, Type S14, for external and internal work has been added to the line of die making machines manufactured by Grob Brothers, South 97th and West National Ave., West Allis, Wis. For internal sawing, any standard metal band from ⅛ to ½ in. wide is inserted into an opening. The band is then joined on the brazer, conveniently mounted on the machine, and the weld is ground to proper thickness with the grinder furnished.

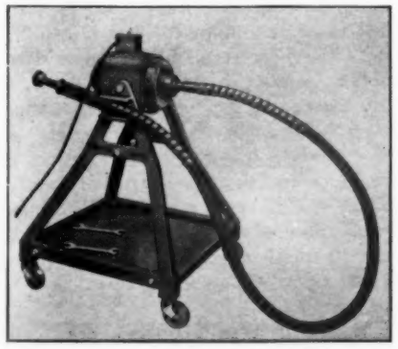
A three-step pulley mounted on a floating motor and a V-belt drive furnishes three speeds. Two V-belt compound reduction drive pulleys are mounted on ball bearings directly to the frame of the base. Belts can be tightened from the outside of the machine. It has a throat of 14 in. The table is 14x14 in. and 45 in. from the floor. Total height, 60 in. Net weight, 360 lb.



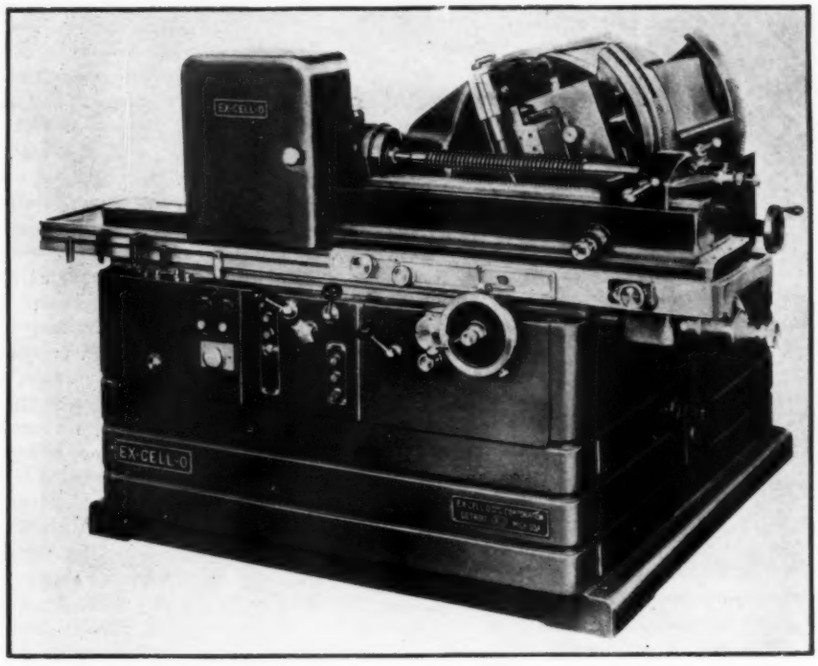
Grob S14 metal-cutting saw

Bingo-G1 Flexible Shaft Machine

Swartz & White Mfg. Co., 243 Water St., Binghamton, N. Y., are now offering a multi-service flexible shaft outfit for grinding, sanding, drilling, burnishing, polishing, reaming and buffing on flat or irregular surfaces. The 6-ft. flexible shaft has a ball-bearing hand piece. The motor is mounted on trunnions on a stand which includes a tool tray. The motor is of ½-hp. and the handpiece has a ¼-in. capacity.



Ex-Cell-O Universal Precision 8-in. Thread Grinder



A universal precision thread grinder, with a capacity for grinding external threads of 8 in. diameter, 24 in. long on a maximum length work piece of 33 in. between centers, is announced by Ex-Cell-O Aircraft & Tool Corp., Detroit. The machine also grinds internal threads on work having threads not smaller than 1 in. diameter, 1 in. long, up to 8 in. diameter, 3 in. long. U. S. Standard form, sharp V, 29 deg. Acme, up to and including 60 deg. thread form and modified Buttress threads with single, double, triple, quadruple or sextuple threads within the range of pitches from 1 to 40 can be ground on this machine. Tapers up to 2 in. per ft. included angle can be ground. A lead tolerance of 0.0002 in. per in. when grinding U. S. S. threads can be maintained.

The machine is automatic in all its grinding operations except for loading and unloading the work and withdrawing the grinding wheel at the end of the cut. It will grind to a predetermined size setting, and then automatically stop feeding; or it may be set so that the table will stop at either end or at any point of its travel.

Rapid approach speed of the work to the grinding wheel in either direction of spindle rotation or table travel is provided. Individual spindle speed adjustments are provided for each direction of table travel or spindle rotation, and are used as work speed adjustments for controlling the speed of the work while grinding. A lead-compensating device corrects the lead error caused by taper setting. A hydraulically controlled backlash compensating device for the lead-screw and gear backlash is also provided. A back-off attachment can be furnished with the machine with capacity up to 18 in. length work. The hydraulically operated wheel dresser is operated from the front of the machine.

The spindle has Ex-Cell-O precision ball bearings. A 3-hp. inclosed driving motor and wheel spindle are mounted in a cradle that can be adjusted so that the grinding wheel will grind up to 30 deg. to suit the helix angle of right-hand threads and up to 45 deg. for left-hand threads.

On a separate rubber-cushioned base, located at the rear of the machine, are mounted the hydraulic pump, oil filter and 3-hp. inclosed drive motor. Coolant is furnished by a vertical centrifugal pump with direct-connected electrical motor mounted on the removable coolant tank.

Pollard Wedge-Lock Factory Stool

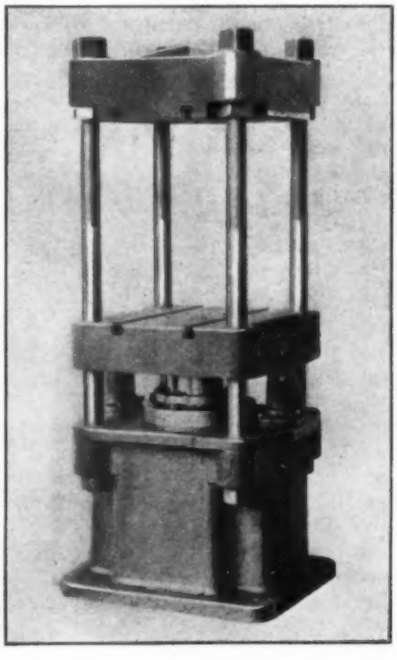
Pollard Bros. Mfg. Co., 4449 North Knox Ave., Chicago, has started production on a wedge-lock type of metal factory stool. The frame consists of two main members which serve as legs. Each leg is one piece of angle steel notched and bent to form the rest for the wood seat. This top of leg or seat is again formed at an angle with the leg, parallel with the seat.

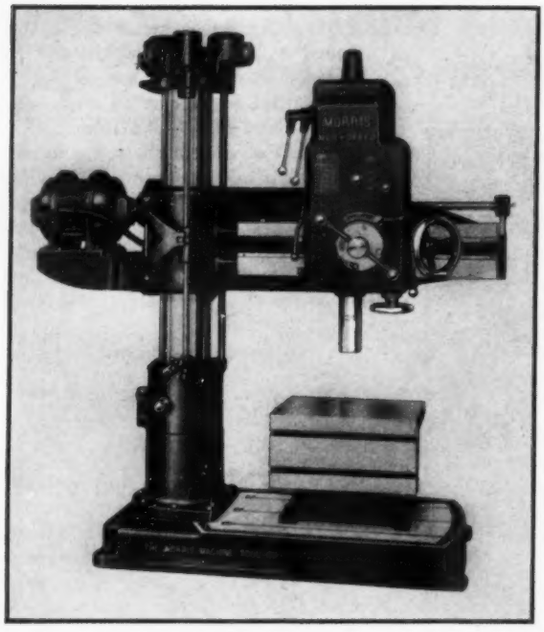
The flat steel stretchers are cut off at an angle to conform with the angle of the leg. When the stretchers are riveted to the leg, the rivet hole is so placed that the stretchers are pulled into the corner, making a wedge lock and a three-point contact. Pressure continually forces the corner of the angle and keeps the stool rigid.

Defiance 75-100 Ton Molding Press

A four-column 75-100 ton hydraulic press, designed especially for molding plastics, rubber and similar products, has been built by Defiance Machine Works, Defiance, Ohio. The main cylinder is mounted in the base and the pullback cylinders are mounted on each side.

Upper and lower platens are 26x24½ in., and have two T-slots running from front to back for bolting the molds. The upper platen, adjustable to give an opening from 12 to 24 in. between platens, is mounted on four 2½-in. columns, which are piloted and bolted to the base. The lower platen is fitted with bronze bushings to slide on the four columns. The space between the columns is 18x16½ in. The main cylinder has a 9-in. ram which gives a 12-in. stroke to the lower platen. Pullback cylinders return the lower platen. Floor space, 30x25 in.; height, 70 in.; net weight, 3,680 lb.





Morris "Mor-Speed" Radial Drill

Designed for high-speed drilling, facing, boring and tapping, the Morris "Mor-Speed" radial drill has centralized control with every operating lever within easy reach of the operator, it has been announced by Morris Machine Tool Co., Cincinnati. The machine has a 9 in. column, and is available with either a 3 or 4 ft. arm. The arm is mounted on ball bearings. Index plates are placed directly at the speed and feed change levers, and are direct reading. The speed and feed changes are located in the head, and changes are made through selective sliding gears on fixed centers. Only the driving gears are in mesh, and there are no overrunning gears or clutches. All shafts and gears, and the spindle and sleeve are made of alloy steel. Gears are hardened and all other parts are heat - treated. Anti-friction bearings are used throughout, and the machine is constantly lubricated with an oil pump in the head. A separate motor elevates and lowers the arm; hand elevating is available.

The drill is powered by a reversing motor, mounted on the rear of the arm to balance the machine and avoid moving the motor with the head. A graduated dial depth gage, for setting drills has a direct-reading plate.

Greenerd No. 81 15-Ton Hydraulic Press

The No. 81 Greenerd hydraulic arbor press, manufactured by Edwin E. Bartlett Co., Nashua, N. H., is self-contained with pressure controls. It provides 15 tons on the down stroke and 13 tons on the upstroke. Combination low and high pressure Vickers pump is driven by a 3 hp. motor, mounted on the side of the head with tank in head. Control valve is either foot or hand operated. Automatic or manual reverse can be made at any point. A stop rod also regulates the length of travel in either direction.

When the ram is at top position the pump bypasses, relieving all pressure. The press is particularly adaptable for light plastic molding inasmuch as there is 15 tons pressure on the down stroke which may be held under even pressure until the plastic sets, then released with a 13-ton pull to open the mold. Adjustments may be quickly made to obtain the desired pressure. Working surface on base, within uprights, 18x24 in. Clearance over working table from 17 to 30 in. as specified. Stroke, 17 in. Travel on down stroke per minute, under no load, 116 in., and on up stroke 148 in. per minute, under no load. Travel 33 in. per minute on down stroke with 6 to 15 ton load, or a 17 in. stroke in 30 seconds.

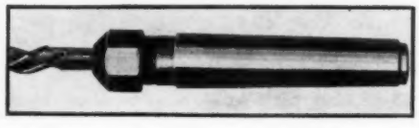
"Kwik-Cote" Copper Plate Solution

"Kwik-Cote," a copper-plate solution, was developed by Grapho Products Inc., Indianapolis, to lower the cost of plating where selective hardness is necessary. It is a chemical compound which deposits a copper plating on the part treated by dipping or painting. Hair-line separation of hardness can be secured, and the results are positive. It is for "pack hardening" only, and is not recommended for liquid or gas furnace hardening.

With this solution, any spot or section of the piece to be hardened can be treated. The solution dries at once, and the piece may be placed in the carburizing pots immediately. A scleroscope hardness variation from 80 to 30 is secured. Threads treated with this solution may be kept dead soft and in perfect condition while the rest of the piece is hard. With a small stiff brush the work can be prepared for hardening in a few minutes, and no further operation is needed. Only the parts to be kept soft are treated. It may be used between cams, back of gears, threads, in bores where stock is left for reaming after heat-treating, and any section to be kept soft. The solution may be used as a base for nickel or chrome plating. The work is thoroughly cleaned, dipped in the solution, the surplus liquid washed off and is ready for plating.

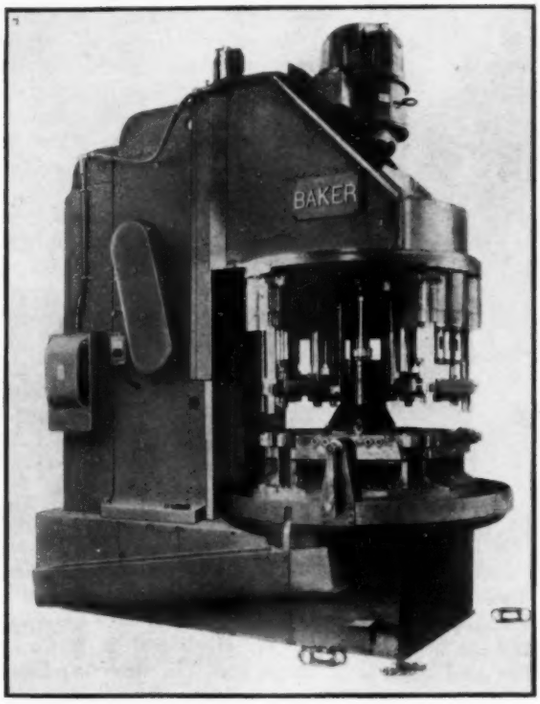
Universal "WW" and "ZZ" Collet Chucks

Two collet chucks have been added to the line of the Universal Engineering Co., Frankenmuth, Mich. The Type "WW" takes shanks from $\frac{1}{8}$ to $\frac{3}{8}$ in., and Type "ZZ" takes shanks from $\frac{1}{2}$ to 1 in. The chucks have extremely strong gripping power, and reasonably close concentricity. They have been especially designed to hold end mills, keyway cutters, drills and other tools of this character. In general design, they are similar to the established "Universal" collet chucks.



Edwin E. Bartlett "Greenerd" hydraulic press

Baker Five-Station Core Drilling Machine

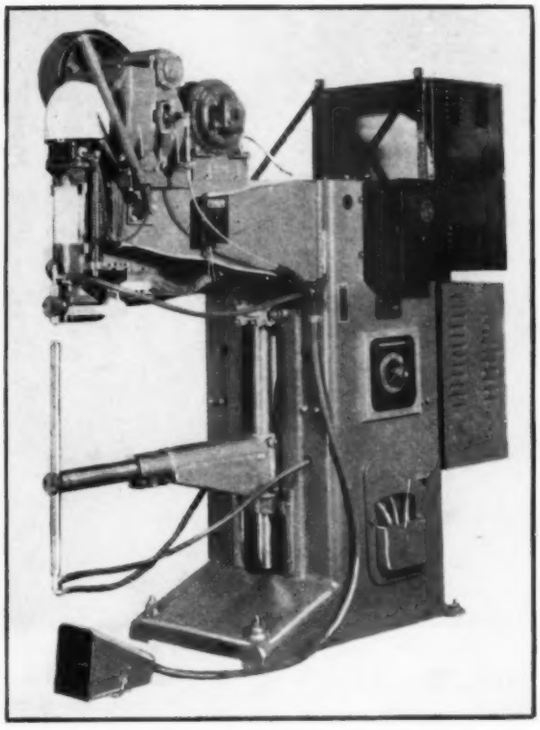


The Baker 60 H.O., a five-station core drilling machine with 30 in. ways, has been announced by Baker Bros., Inc., Westlake & Post Sts., Toledo, Ohio. The machine has a long saddle and a large size head with extreme overhang. Double feed and delayed reverse, a coarse boring feed with automatic change to fine feed for facing and a positive stop allowing several revolutions before tripping, are incorporated. The machine assures a squared faced surface. It is equipped with a simplified hydraulic rapid traverse. The pieces produced by the user are a right and a left tractor link in each cycle. The operator chucks while tools are cutting. In each piece two holes are core-drilled and reamed, and a large hole is rough and finished counterbored.

Thomson-Gibb Special Press Welder

A resistance welder has been developed by Thomson-Gibb Electric Welding Co., 261 Pleasant St., Lynn, Mass., to weld two thicknesses of $\frac{1}{8}$-in. corrosion-resisting steel plate at a production rate of 30 to 40 spots per min. It is the split type head, equipped with a hand lever so that the upper electrode can be located on the work with accuracy before the power-driven, mechanically operated pressure device goes into action. This allows making spot welds on somewhat lighter material by manually operating the upper head. A push-button at the end of the hand lever permits both pressure and current to be controlled by the same hand. The lower arm is adjustable through a range of 24 in.

A 150 kva. welding transformer, an auto transformer and two seven-point regulator switches, which in combination, provide 49 points of welding voltage and current regulation, and an automatically adjustable timing device are features of the machine.

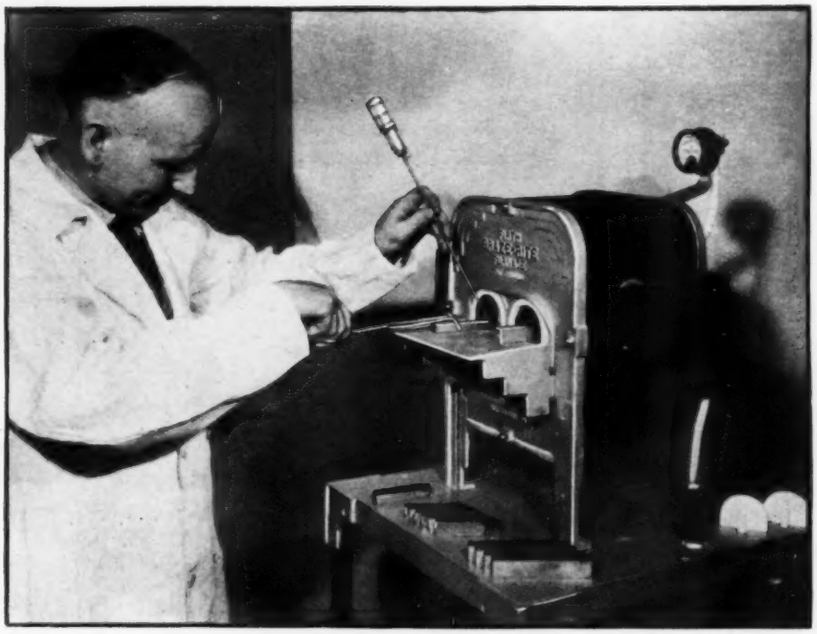


Specially built for shipyard work, this Thomson-Gibb press resistance welder handles corrosion-resisting steel plates up to $\frac{1}{8}$ in. thick

Monarch Cam-Locked Flanged Spindle

Monarch Machine Tool Co., Sidney, Ohio, offers a cam-lock flanged spindle nose as optional regular equipment on all sizes of engine lathes and toolroom lathes from 12 to 18 in. size, inclusive. This type of spindle permits quick clamping or removing of chucks, plates and fixtures to the spindle nose. The design prevents these parts from working loose even under severe conditions.

The entire spindle is hardened to about 60 Rockwell C. All cams, studs, locks and screws are hardened. The flange nose is $7\frac{1}{8}$ in. diameter. Because of its standard dimensions, it permits great interchangeability of chucks and special fixtures. The locating surface on the flange spindle, the tapered centralizing section and the taper bore are accurately ground. The spindle nose is "file-hard," and will retain its accuracy throughout the life of the lathe. On Monarch lathes from 20 to 36 in. the regular 11 in. flange spindle nose will be furnished as regular equipment, but the cam-lock type of spindle is furnished at extra cost.



Firth "Braze-Rite" Hydrogen Furnace

An electrically operated hydrogen brazing furnace, the Firth "Braze-Rite," designed for tipping sintered carbide cutting tools, is announced by the Firthite division of Firth-Sterling Steel Co., McKeesport, Pa. With the furnace, tools of a wide variety can be brazed in less time than heretofore because heat is localized where the carbide blank is to be mounted, eliminating the necessity of heating the entire shank, the company claims.

Two separate muffles of 2-in. capacity are provided. Made of a high heat-resisting alloy, they withstand brazing temperatures and offer long life. Tools from small bits up to those with 1½ in. square shanks can be accommodated.

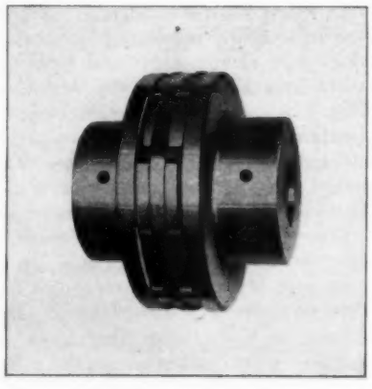
Either 110-220 volts a.c. or d.c. is used. A direct-reading pyrometer is mounted at the rear of the furnace. The furnace is brought quickly to brazing temperature. When the furnace is shut down gradual current reductions are not necessary, making the furnace exceptionally suited for either work on small quantities of tools or continuous operation.

Brazing is done in a hydrogen atmosphere, preventing oxidation of the carbide tip, shanks and brazing material. Hydrogen is admitted through the rear of each muffle and controlled by valves.

In tool brazing, the recess of the tool to be tipped is covered with flux. Then the shank is inserted into the chamber and preheated. It is then withdrawn and the sintered carbide blank and copper are set into place, and the tool is inserted again, and remains until the copper has melted. The tool then is withdrawn slightly and the tip firmly pressed into position. This method assures brazing with a solid bond.

Lovejoy Heavy-Duty Flexible Coupling

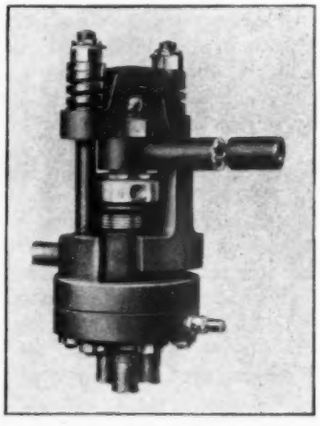
Lovejoy Tool Works, 4956 West Lake St., Chicago, Ill., is manufacturing a non-lubricated, heavy-duty flexible coupling designated as L-R Type "W". The individual load cushions are free floating between the metal jaws and rest upon the central hub, being secured by a spiral steel spring. Cushions are free to move and adjust themselves instantly to any momentary position of the jaws, making the use of larger hubs possible, and permitting greater load carrying surfaces and increased load carrying capacity. Load cushions are visible for inspection and can be removed and replaced in a few minutes when necessary. There are no metal to metal contacts and no wear on the iron or steel jaws.

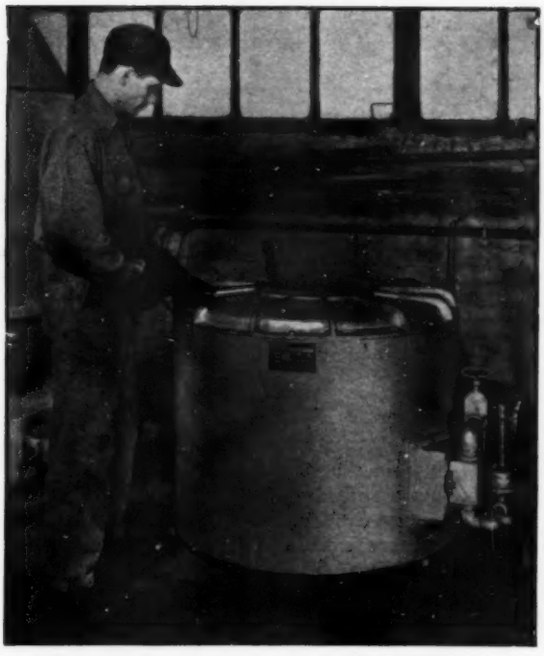


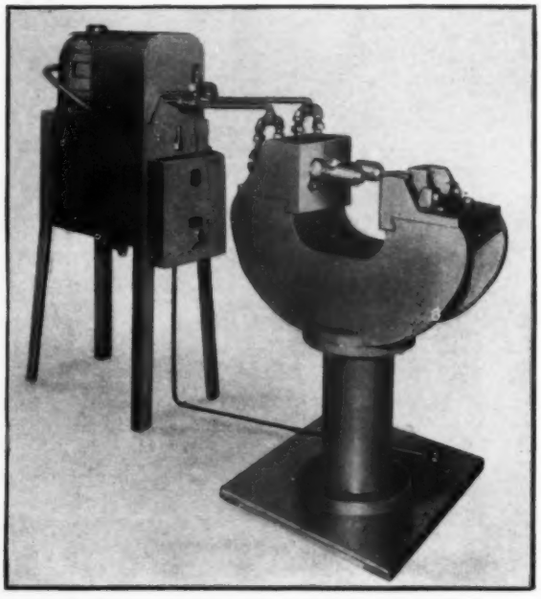
In operation, one half of the cushions are idlers, except on reversing loads. Hence there is always a set of new cushions in the coupling which can be interchanged when machines are not in productive operation without tearing down coupling. Three types of resilient cushioning materials are available: a brake lining material, used for heavy shock loads and machines exposed to extreme weather conditions; oak-tanned belting leather, for use on sustained loads and greater misalignment; and a rubber-duck fabric, vulcanized under pressure, for fluctuating loads and where high resilience is required.

Nicholson Hydraulic Valves

Style "H" Nicholson hydraulic valves, for oil or water service up to 5,000 lb. pressure, furnished in 2, 3 and 4 way types, have been announced by W. H. Nicholson & Co., Wilkes-Barre, Pa. The valve is made with an exceptionally large diameter stem which is connected to the disk with a large-area bolt. This, with the disk, serves as a differential piston. Pressure is always maintained in the body of the valve, exerting force downward on the disk with its larger area, and upward on the stem with its somewhat smaller area. The valve is thus balanced, permitting the disk to work easily upon its seat, and hold tight. Two spring adjusting nuts are used to exert any required downward pressure or counterbalance on the stem, through the crossbar and ball, in order to overcome any back-pressure. It is designed with air cushions to ease the shock of water hammer against the stem. Furnished in cast steel or bronze bodies; monel stem.







Designed to rivet axle housings, this Hannifin 35,000 lb. riveter heads ¾-in. cold rivets

Lindberg "Screw Type" Pot Furnace

By carrying the flame around screw-wise inside of a combustion furnace, the Lindberg Engineering Co., 221 Union Park Court, Chicago, Ill., shows increased efficiency and greater production with their line of "screw type" pot furnaces. The gases circle the furnace several times, insuring complete combustion. The combustion chamber is built in the form of an internal screw, or helical path, which forms a continuous channel for the flame around the pot. The flame makes a minimum of two-and-a-half turns around the pot, a distance of about 10 ft. The burning arrangement, with tangential firing, minimizes the effect of flame impingement on the pot and walls. The furnace is furnished in six sizes, with pots from 12x18 in., to 24x24 in., and overall dimensions from 40 in. diameter x 34 in. high, to the largest size of 48 in. across, and 40 in. high.

Hannifin "Hy-Power" Hydraulic Riveter

Designed especially for an assembly operation on axle housings by Hannifin Mfg. Co., 621 South Kolmar Ave., Chicago, the "Hy-Power" hydraulic riveting machine has duplex hydraulic rams. These are actuated from a hydraulic pressure-generator unit driven by a 2-hp. motor and equipped with automatic electric control valves. A special work-holding fixture makes handling simple. Control is by a single foot-switch button, which may be located at any convenient point. Control actuates the pump unit and automatic valves, the riveter cycle being completed automatically.

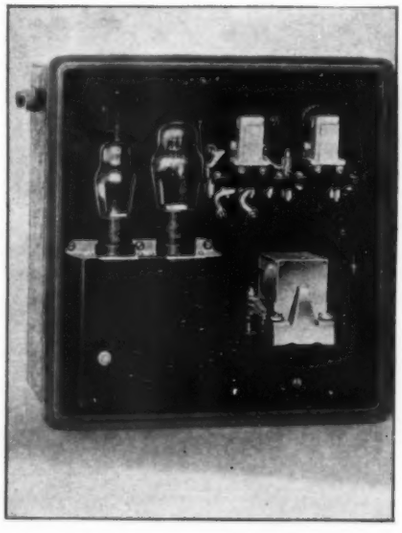
The riveter ram develops 35,000 lb. pressure, ample for heading ⅜-in. cold rivets. Equal pressure is applied to head both rivets, regardless of rivet length. The machine heads more than 1,800 rivets an hour.

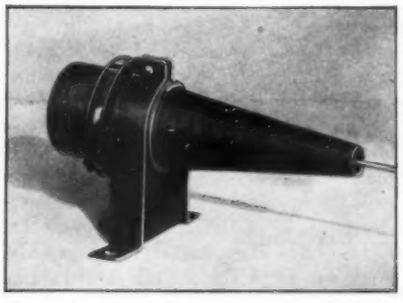
"Protectoglo" Combustion Safeguard System

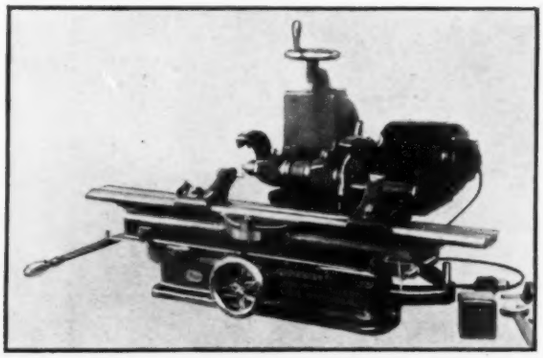
A line of "Protectoglo" equipment has been placed on the market by the Brown Instrument Co., a division of Minneapolis-Honeywell Regulator Co., Philadelphia, Pa. It includes two types of relays and a flame sensitive electrode which can also be used as a special spark plug for electric ignition. Any standard primary controllers and motor valves are used to complete the system of combustion safeguard. Among industrial applications of the equipment are gas-fired furnaces for heat-treatment of steel and its alloys.

The relays contain the thermionic tubes for rectification and amplification of the power input which, when conducted from the electrode unit to ground through the flame, operates the relay units controlling the operation sequence and main fuel valve. Any interruption in the circuit to ground through the flame, such as flame failure, causes instantaneous shut-down. The cast-iron dust- and moisture-proof cases are for front or flush mounting.

Standard radio-type vacuum tubes are used, and are well protected and under lock and key. The relay can be located in any remote location. The terminal board is in a separate moisture-proof chamber in the relay case.







Union Twist Drill No. 1 Tool Grinder

A tool grinder for sharpening, on centers, straight or taper end mills and reamers with either straight or spiral flutes, has been announced by Union Twist Drill Co., Athol, Mass. This No. 1 grinder takes 21 in. between centers with a maximum distance of 8 in. between wheel and center, and will grind cutters of 3 in. diameter. The wheel spindle is of steel, hardened and ground, and runs in bronze boxes adjustable for wear. It takes a wheel on either end. The vertical adjustment is ½ in. above or below center line of work. Its traverse movement is 2½ in., and is operated by a hand wheel in front of machine.

The table runs on roller bearings and is graduated to swivel 10 deg. either way for tapered work. It can be swiveled 30 deg. either way where travel is short to permit chamfering. It is quickly transferred from one end of the base to the other for use in grinding both right and left-hand shank cutters. The machine takes a 4x¼x½ in. grinding wheel, and is driven by ⅓-hp. motor. It is equipped with diamond holder, tooth rests for straight or spiral work and necessary wrenches. Weight, boxed, 395 lb.

"Pen-A-Trate" Joint Breaker

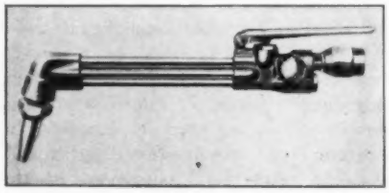
"Pen-A-Trate" developed by Grapho Products, Inc., 2232 Alvord St., Indianapolis, breaks the most obstinate joints, no matter how rusted or corroded, almost instantly. The product is a quick-creeping, quick-acting fluid that penetrates into the threads or between the faces of the joint to be broken. It is claimed to form a gas that quickly dissolves the rust or corrosion into a fine powder, and permits the joint to be broken with ease. It has no lubrication value and cannot be used as an additive for lubrication purposes. Non-injurious to metal and non-explosive, it will only burn under intense heat. Where threads are only rusty the rust is dissolved and the metal surface is as good as new.

Disston "Nu-Mol" Hacksaw Blades

Nu-Mol hacksaw blades, produced by Henry Disston & Sons, Inc., Philadelphia, Pa., are claimed by the company to be the most advanced development in general-purpose hacksaw blades. The wear resistance has been predetermined by Disston research and experimentation. Where carbon and molybdenum blades have been used, Nu-Mol is proving to be tougher, stronger, more productive and economical, according to the company.

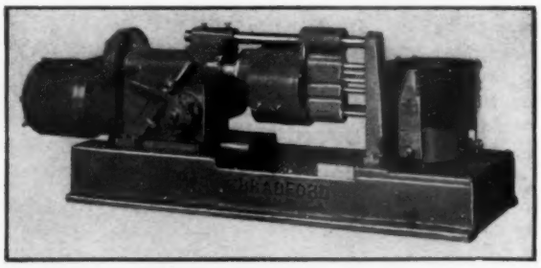
"Oxweld" Type CW-22 Cutting Attachment

The Linde Air Products Co., 30 East 42nd St., New York, N. Y., has announced the "Oxweld" Type CW-22 cutting attachment which can be used



on either the Type W-17 or W-22 welding blowpipe handle, thereby extending the utility of these two blowpipes. The attachment is designed to handle light sheet metal as well as all but the heaviest work at speeds and efficiency equal to those of the full-size cutting blowpipe. The attachment operates on low-pressure or medium-pressure acetylene. Body of the CW-22 is of pressure-forged bronze while the head is a manganese bronze forging.

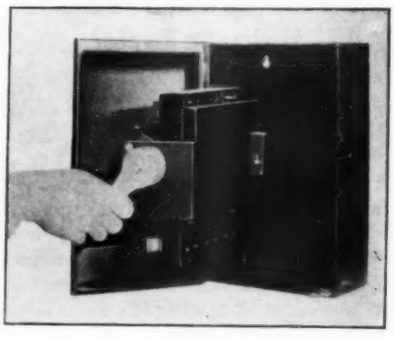
Bradford Semi-Automatic Drilling Machine



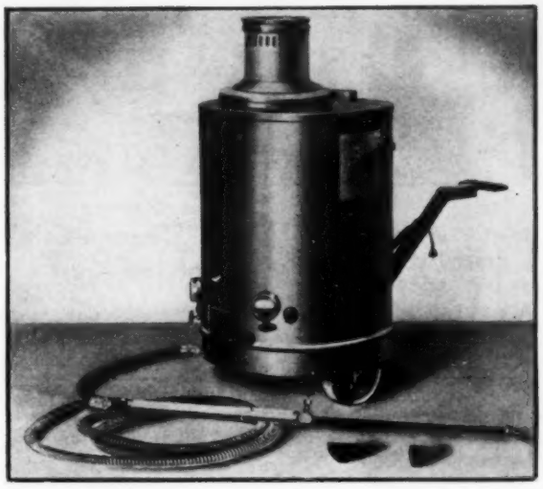
A bench-type, semi-automatic, five-spindle drilling machine recently was built by Bradford Machine Tool Co., 657 Evans St., Cincinnati, to drill 45 holes in a Textolite bucket for rayon spinning. Holes are located in nine groups of five holes each, spaced equally around the periphery of the bucket. Four of the holes in each group are No. 55 and one is No. 48. The operator loads the bucket in the fixture by pressing it down into three spring-actuated fingers, and then raises the starting lever of the machine. The machine then runs 45 seconds drilling all the holes in nine automatic indexes, and stops until again reloaded. The holes are cleanly drilled and break through into the inside of the bucket without burrs or defects.

Square D Swing-Out Industrial Switch

The swing-out interior feature has been incorporated in the Type "C" and general purpose 30- and 60-amp. switches, it has been announced by the Square D Co., Detroit Mich. This feature permits the entire base and operating mechanism to be swung out and away from the box, giving the entire box area for bringing in conduit and wires. When the wiring has been completed the base is swung back into normal position and secured by a set-screw. The base is elevated from the back of the box so that wires may be run underneath it.



Hypressure Model "G" Cleaning Jenny

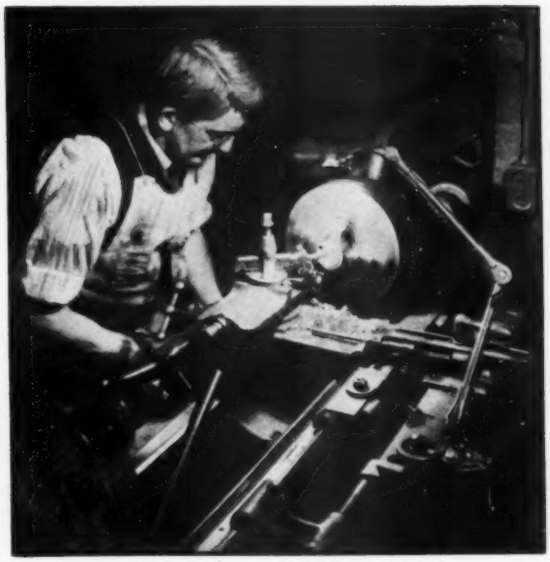


Homestead Valve Mfg. Co., Coraopolis, Pa., manufacturers of high-pressure vapor spray cleaning equipment, announces entry into the low-priced cleaning equipment field with the Model G "Hypressure Jenny." Cleaning is done by applying a combination of water vapor, hot water and cleaning chemicals, over a pressure range from 50 to 150 lb. per sq.in. through a nozzle to the surfaces to be cleaned.

The unit is fully contained, carrying water, solution and oil tanks, oil burner, vapor generator, water and solution pump, electric motor and a specially constructed vapor hose with a variety of shaped nozzles. It burns standard kerosene or light furnace oil.

Barrett Checkless Lift Truck

A checkless lift truck of 1-ton capacity has been announced by Barrett-Cravens Co., 3255 West 30th St., Chicago, Ill. It is available for any type, make and size of skids, and can be had in 6, 7, 9 and 11 in. heights and either 18 or 24 in. wide. The length of the carrying frame ranges from 24 to 72 in., and the lift is 2 in. Load lifting is all automatic, there being no treadle to engage. When the handle is pulled down the load comes up. The load is lowered by first stepping on the release treadle, then the handle is lowered to completely disengage the latch. The load is then controlled downward by the grip on the handle. It is of four-wheel construction, Hyatt equipped.



Fostoria machine lamp, showing the two-arm style. No. 16, described here, is a smaller unit with one arm, to be used where a small, localized light is required

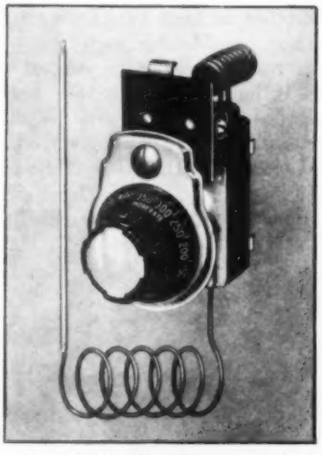
Hart Hydraulic Thermostat

A hydraulic thermostat, designed for industrial heating equipment where accurate remote control of temperatures is desired, has been developed by Hart Mfg. Co., Hartford, Conn. It can be used for air or liquid temperature control as in electric ovens, dryers, heaters and glue pots. The active element is small and compact, and can be easily mounted in the most convenient place. It cannot be damaged if struck. The control knob with temperature readings can be located in any convenient exterior part of the equipment. Calibrations can be made without removing the knob. A low-voltage pilot light with red indicating bull's eye, to indicate when the desired temperature has been reached, is optional.

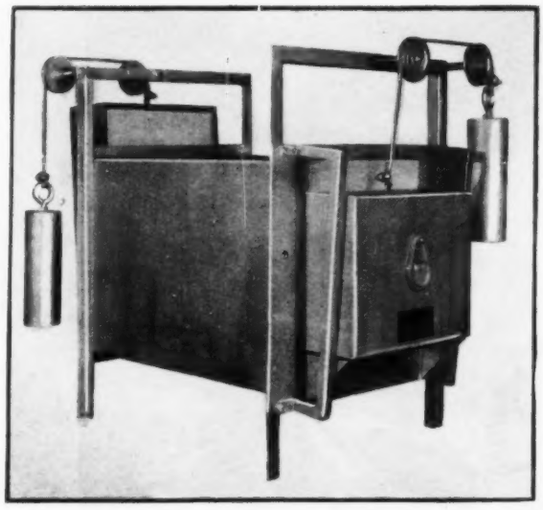
Temperature range 100 to 550 F. The device can be applied to new or installed equipment. The remote control knob can be placed anywhere.

Fostoria No. 16 Small Machine Lamp

The No. 16 machine lamp, a smaller unit, is being made at the Fostoria Pressed Steel Corp., Fostoria, Ohio. It was designed for any machine where a small localized lighting unit is desirable. It is fitted with ball and socket joints for maximum flexibility and will withstand shocks and vibration of modern machine operation. A small reflector offers direct, glareless light with either 15 or 25 watt bulbs. The unit's base is drilled with ¼-in. holes and may be bolted directly to equipment, or to a special clamp that eliminates drilling holes in the machine. Standard colors are black and green, but units will be furnished in any finish desired, including chromium.



Hart hydraulic thermostat for industrial heating equipment



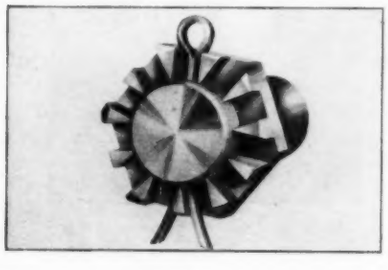
Trent "ML" Electric Furnace

A variation of the Trent "ML" type electric furnace has been announced by the Harold E. Trent Co., 618 North 54th St., Philadelphia, to be run at 2,000 F. It is supplied with a door at each end. This furnace was made for special brazing work, the operators working at each end of the furnace. The inside dimensions are 7½ in. wide x 5¼ in. high x 14 in. deep, and the connected load is 5 kw., 220 volts. The temperature is maintained with pyrometer control.

Cooke Micro Slotted Nut

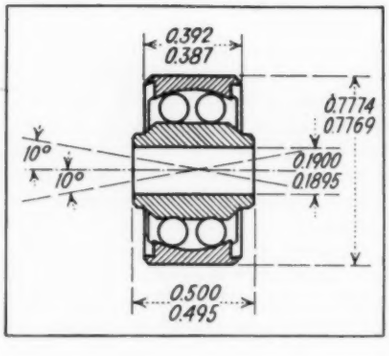
The Blatchford Corp., 80 East Jackson Blvd., Chicago, Ill., has started production on the Cooke "Micro Slotted" nut. This nut offers from 10 to 22 adjustments per turn, depending on size, instead of the usual 6 per turn. This adjustment is achieved by locating the keying wedges off center from one another so that two keying positions are possible for each slot. At keying position, a wedge centers the hole. If hole and wedge are not in keying position at first trial, a slight tightening will bring a wedge into position at one end or the other of the hole, for the key can be inserted from either end. Because of this closer adjustment, from 0.008 to 0.013 in. depending on size, there is no need to back off the nut to get a keying position or to tighten with shims.

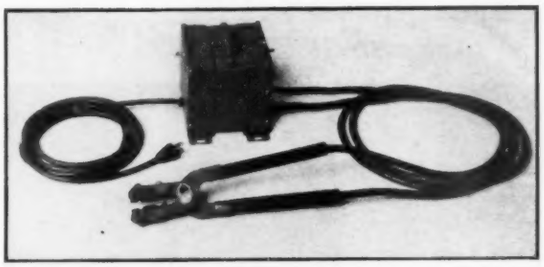
The key is set by tapping it in with a hammer. No pliers are needed. The key spreads automatically, curving outward, and filling the space between wedge and sides of the hole, locking bolt, nut, and key. A special key accompanies each nut. The end of the key is trimmed off to an internal V-shape so that it spreads readily around the keying wedge on the nut.



Fafnir Shielded Self-Aligning Bearings

The Fafnir Bearing Co., New Britain, Conn., is now making a group of ball bearings which combine internal self-alignment with double grease-shield protection. The bearings are of the double-row type with two rows of balls operating on a spherical race surface on the outer ring to provide self-alignment under shaft misalignment conditions up to 10 deg. The double metal shields are joined to the outer ring and maintain a minute but constant clearance from the inner ring at any position of self-alignment. Two bearings of this type are now available. The DKS-3 has a static radial non-brinnel capacity of 900 lb., and a static thrust capacity of 190 lb. Capacities for the larger DKS-4 are 1,100 and 240 lb., respectively.





Ideal "Thermo-Grip" Hot-Jaw Pliers

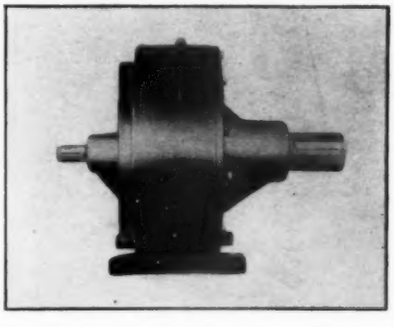
Portable electric hot-jaw pliers have been added to the line of motor maintenance equipment and electrical specialties made by the Ideal Commutator Dresser Co., 1439 Park Ave., Sycamore, Ill. This unit, called "Thermo-Grip," is an electric heating tool which takes the place of an open-flame blow torch or burner. When plugged into any a.c. lighting circuit, current passes through the transformer and rapidly heats the jaws to a white-hot temperature.

In production work it is used for small soldering and heating jobs otherwise requiring a blow torch with open flame. The pliers have renewable carbon jaws, insulated fibre handles, and a "hi-lo" heat control and "off-on" switch. Current is supplied from any a.c. line. Current is only consumed when pliers are being used.

The unit weighs 14 lb., is safe, shockproof and sturdily built.

Winfield H. Smith Planetary Reducer

A line of planetary speed reducers has been added to the list of Winfield H. Smith, Inc., Springville, N. Y. The differential reducer provides any ratio from about 20 to 1 up to infinity, within reasonable commercial limits of variation. The whole, in a compact casing, is a compounded device with additional stages added to the primary planetary system. Gear-tooth alignment is preserved by a specially designed planetary gear carrier.



The Round Table

WHEN TO WELD?

"So you want to spend some more of my money putting in a big flame cutting outfit, Al."

"Just forget the 'your money' part of it, Ed. That's an argument in itself that I may thrash out with you later. And if you think the cutting outfit isn't a good investment you're more of a back number than I thought."

"Now don't get sore, Al. I know that torch cutting has its place in many shops. That little rig we have is fine for a lot of small, odd jobs. But why the new outfit?"

"To save time and money, Ed. Not only your money, as you call it, but the customer's money too."

"Now you are getting me inquisitive, Al. I don't see how it can affect us one way or the other so as to be noticeable."

"It's this way, Ed. I've been reading a lot about using steel plate for bed plates and frames of machines. Didn't seem to mean much to us until I visited a little shop in Jamesburg the other day. Then I saw where we'd been missing a bet."

"Go on, Al. I'm still listening."

"This Jamesburg shop had just finished a special machine and made a nice profit on it all because of the plate metal construction. If they had made patterns and castings, the price would have been much higher and the time necessary would have lost the order."

"Just how does that fit us? Or are you going into special machine building?"

"Of course not, Ed. But you know we have lost orders for special pumps because of pattern cost and time of delivering. If we'd had this flame cutter we could have had the order and a neat profit too."

"Guess I'm old-fashioned, Al, but these steel frames don't appeal to me. I wouldn't buy a pump with a built-up plate frame. Welding is too uncertain."

"You are a back number, Ed. Many of the big concerns have abandoned castings for large special machines. They save pattern cost, weight and time."

"If it's a good plan for large machines why not for small ones, Al. Why not go whole hog while you're at it?"

"It isn't so much size as quantity, Ed. Where you have large enough

quantities, castings are probably cheapest. But for specials, large or small, plate construction seems to have the bulge on the old way."

"What about burning the metal, Al? Seems to me the heat of cutting would start cracks."

"We used to think so, Ed. But when the railroads cut out side rods and crossheads with the torch, it must be O.K. Only thing is to leave a quarter inch of metal for finish."

"I still prefer castings, Al. They look more substantial."

"Some still prefer the old milk-wagon type auto but I notice your new one isn't built that way, Ed."

Is Ed's objection to flame-cut plate justified? Or will the new outfit save time and money as Al contends?

DISCUSSION

Gaging Gages

Master gages are of course susceptible to wear, as Al says, but to employ this as an argument against their use is to draw the line pretty fine. Master gages should be kept under lock and key, and be made accessible to one head inspector only. This man should be a thoroughly competent man, and should be held individually responsible for the keeping and the condition of them.

Under such a system a very high degree of gage accuracy can be maintained, and this has much to commend it as against the sending out of gages to a laboratory. Sending out the gages can easily lead into confusion in a great many cases, particularly where there are intricacies in manufacture, in products and in gages which are well understood in the home shop, but which cannot be so readily conveyed to an outside man. This is a strong argument for "gaging the gages" in one's own shop. —JOHN E. HYLER.

To check gages one must possess another set that are accurate within a few more decimal points, besides other

instruments such as comparators, micrometers and measuring machines. Above all, the work must be done by men of such temperament that they can see "tenths" and smaller amounts as if they were inches and feet. All of these necessities make for a costly combination.

Gages, like everything else, wear with constant use, but their accuracy is usually taken for granted because of the fact that they are gages. There is only one cure for such a condition; that is, to send them out periodically to a reliable place to be checked, and to be corrected if worn too much. Nowadays ring and plug gages are easily corrected by hard chromium plating. Thread and other types of gages must be replaced. Master size blocks wear too in time, but it is not always necessary to discard them when worn only a little. If a reputable gage maker and checker supply a report on how much each block is off, these master blocks can be used further by making allowance for the known wear. In all cases the gages should be checked by a firm that is thoroughly reliable. —Edward Heller.

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Manicuring Machines

Al's idea of employing a skilled cleaner is absolutely sound. It is also good business. Suppose there are 80 men working in Al's shop. If he shuts down his plant one-half hour early each Friday afternoon, it represents a total of 40 hours of "down" or idle machine time and 40 man hours taken out of production. These 40 working hours turned to production will pay for a cleaner many times over. Furthermore, many machinists do not like to clean machines and will do a slipshod job.

It is my opinion that a skilled cleaner can save considerable money in a shop of medium or large size. Clean machines function properly and continuously. Down or idle time for repairs is materially reduced. The clean shop has a business-like appearance which is reflected in the employees. An unclean shop gives one the impression of hit or miss production. Al's idea is a corker!

—Roger C. Dickey,
The International Paper Box Machine Company.

Another Shift

Al's daily itinerary through the shop should reveal many things not blatantly asking for comment. Awkwardness in an operator's handling of his machine or his work is sufficient to set Al's gray matter to work. He wonders whether the apparent awkwardness is peculiar to the man or whether it is the result of poor machine layout. A battery of machines may be so arranged that the flow of work thereto or therefrom is neither so direct nor convenient as might be expected. Al wonders if it is not possible so to order matters that everything shall proceed in orderly and even sequence.

In the drafting room, Al will doubtless see to it that the lighting is adequate. If he is called to consult with one of the draftsmen and has to wait overlong for a needed reference drawing, he will inquire into the system whence drawings are issued and how they are located when they are once out of the safe.

Evidently, Al looks about him, not

only in his own shop, but also when he is visiting other shops, and takes note of what specially commends itself to him. That is what all responsible engineers should do, and they should be on guard against the so-easy danger of mere complacency. The right shifts can greatly assist production and, what is often of as great value, avert decadence. —W. ROLAND NEEDHAM, *Stafford, England.*

Difference in opinion invariably exists between men employed in machine shops as to the proper position of benches and machines to get the best light for maximum productive efficiency. During the past 35 years I have worked in various plants having benches and machines arranged in different positions; the operator facing the window; with his back to the window; at a right angle to the window; and double benches in the center of a large shop.

Personally, I consider the best position for either benches or machines to be at a right angle to the window, as eye strain is considerably lessened. Of course, the type and the condition of the windows are important factors in shop lighting. A few years ago a number of tests were made in our shop and it was found that with vertical glass the transmission of light decreased rapidly during the first 21 days after cleaning, from a normal of 80 per cent for clean glass to 60 per cent as the glass became dirtier.

It was found that slanted glass collected more dirt. At slopes of 15, 30 and 45 deg., the transmission of light decreased from 80 per cent to 55, 50 and 45 per cent respectively in the first 21 days, and to 25, 20 and 15 per cent at the end of 100 days. While sloping windows admit more light than do vertical ones, their advantage is soon lost unless the glass is frequently cleaned. —A. EYLES. *St. Albans, Hertfordshire, England.*

Open House

While it is true that in many small shops there is not sufficient work for a full-time toolcrib attendant, the issue and inspection of small tools could easily be put in charge of some one man in addition to his other duties, preferably the toolmaker. Where there is no check on the tools, it is the grievance of the workmen that often the only tools available are those that have been spoiled by the men who have previously used them. Damage to tools can go on for a long time without being discovered if there is no check on who used them last.

Under the help-yourself system there is always a shortage of tools, as many men, after they have used them, keep them in their tool chests and other men spend time in trying to find them.

An accurate inventory of small tools taken at regular intervals is important. Tools wear out and unless the worn ones are promptly replaced there will be a shortage, and men will have to waste time in waiting for the tools they require. Having no proper system in regard to the issuance and inspection of small tools not only involves the shop in losses, but it seriously inconveniences the workmen, owing to the tools they require being either spoiled or not being available when wanted. —W. E. WARNER, *London, England.*

Here's some plain talk on the question of gage finish. Bright glitter—really a reflection of countless scratches—means inaccuracy and shortened service life. *True* finish is a lapped gaging surface so hard, so smooth, so mathematically exact, that it appears *dark* under the microscope! 100 magnifications will bring out these qualities as sharply as the flaws in less careful work. Only when the lens shows a relatively *unmarked* surface will a gage measure the maximum of work per dollar of its cost. At Taft-Peirce, an extraordinary amount of care goes into the grinding and lapping of gaging members. Put any of these gages "on the spot" with any others, and you will see that while *all* are standard in design — materials and manufacturing methods still vary as widely as trademarks. The trade-mark by which Taft-Peirce products and services are known the world over is a standard symbol of quality and precision, "the T-P Gage."

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TRADE PUBLICATIONS

BENCH MILLER. No. 3 universal bench miller manufactured by Pratt & Whitney Co., Hartford, Conn., is described in circular 422, just issued.

CANADIAN TRADE INDEX. Canadian Manufacturers Association, Bank of Hamilton Bldg., Toronto, has issued a completely revised edition, 1936, of its "Canadian Trade Index." Price, $6.00, postage prepaid.

COMPRESSORS AND VACUUM PUMPS. Catalog 7502-E, issued by Ingersoll-Rand Co., Phillipsburg, N. J., covers the company's line of "Type 30" industrial compressors and vacuum pumps.

CONTROL INSTRUMENTS. "Instruments from the Executive Viewpoint" is a booklet issued by Brown Instrument Co., Philadelphia, describing economies found in measuring and controlling temperatures. Catalog 1101 describes the company's line of potentiometer pyrometer and control systems.

DIE AND MOLD MILLING AND ENGRAVING. Friedrich Deckel machines FP1, GK and G are described in catalog F. 0.10.e, available from H. P. Preis Engraving Machine Co., 155 Summit St., Newark, N. J. Die and mold production is described in another booklet, GKE.e. 201, copiously illustrated, and detailed grinding instructions for single lip cutters for engraving, profiling, mold milling and die milling, are shown with illustrations and drawings in booklet GS.e. 351.

DRILLS, REAMERS, CUTTERS. Whitman & Barnes, Inc., Detroit, has issued catalog No. 95 on twist drills, reamers, cutters and other small tools. Included is 20 pp. of data in the 194-p. book, printed in color. Unusually careful and complete indexing makes it a handy reference book.

ELECTRIC CABLE. General Electric Co., Schenectady, N. Y., has issued bulletin GEA-1918A on portable electric cable for welding and other industrial uses.

ELECTRIC HEATERS. "a.c.f. Berwick" electric metal heaters are described in a circular just issued by American Car & Foundry Co., 30 Church St., New York.

FLEXIBLE SHAFT MACHINERY. A folder issued by R. G. Haskins Co., 4636 West Fulton St., Chicago, gives detailed information and prices about sanding drums, sleeves and other accessories for flexible shaft equipment. In writing the company, please ask for bulletin No. 4630.

GRINDING. "Grinding and Finishing With Portable Equipment" is a 20-p. illustrated booklet issued by Norton Co., Worcester, Mass.

INDUSTRIAL RESEARCH. Facilities for industrial research offered by Ohio State University, Columbus, are shown in a brochure issued by that university.

IRON PIPE. Threading, uses for air conditioning, industrial maintenance and production processes are new sections in the fourth edition of "Toncan Iron Pipe for Permanence," issued by Republic Steel Corp., Cleveland.

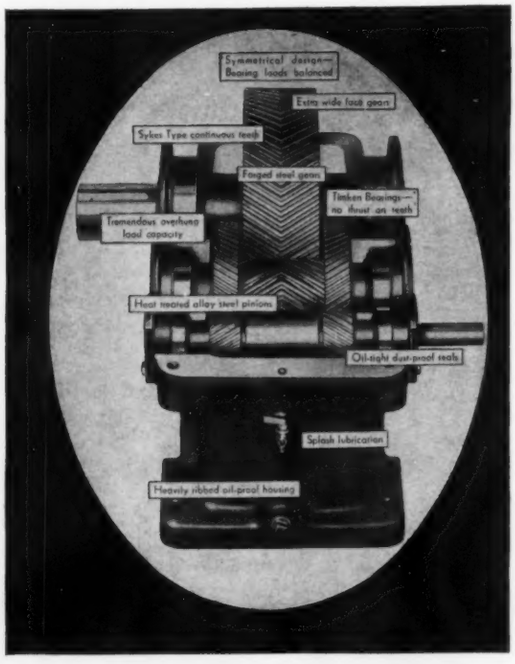
MATERIALS HANDLING. "Trucks in the Mechanical Industries" is the title of a 16-p. illustrated booklet published by Baker Industrial Truck division, Baker-Raulang Co., 2168 West 25th St., Cleveland, showing a wide range of uses.

★

RUGGED

all the

way through



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